Bed Blocking and the City

An analysis of the factors explaining variation in the number of days associated with specific measures relevant to patient discharges one year after implementation of the coordination reform within the municipality of Oslo.

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ABSTRACT

BACKGROUND: The policy implications of the "Coordination Reform," introduced in 2009, became effective at the beginning of 2012. As a result, one of the major changes was a policy that shifted payment responsibility for patients ready for discharge to the municipalities beginning the same day a patient is deemed ready for discharge by the hospital. This policy is in an ongoing implementation phase and a variety of effects and changes has already been and will continue to be observed as a result of this measure.

OBJECTIVE: To examine the effects, on both municipal and hospital behavior and decision making, one year after implementation within the municipality of Oslo. More specifically, to explain the variations in delayed discharge, for those somatic care patients who will require municipal services upon being discharged, by characteristics of the patients, the hospitals and the city districts.

METHOD: Discharge data from before and after reform implementation was used to statistically test for significant differences between 2011 and 2012 in the periods of time related to delayed discharges. Probable explanations and predictions, for variations related to any significant differences, were then explained by multivariate linear regression using continuous time variables related to delayed discharge with independent demographic and geographic variables. Variables representing and explaining supply and demand of healthcare services within the city districts were then included.

RESULTS: There was a statistically significant decrease in delayed discharges between 2011 and 2012. When looking at the individual city districts, this difference can be explained by a statistically significant positive effect of the proportion of inhabitants over the age of 80 and a significantly negative effect of per person spending on nursing care. The type of municipal service location to which patients were sent upon discharge also had a significant effect. The results indicate that districts with higher percentages of elderly inhabitants have greater delays in discharges, and districts with greater spending on nursing care have less discharge delays.

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ABBREVIATIONS AND ACRONYMS

Ahus	Akershus University Hospital
DRG	Diagnosis Related Groups
FOR	Regulation
GP	General Practitioner
KOSTRA	Municipality-State-Reporting
LOS	Length of Stay
LOV	Law
NHS	National Health Service (UK)
NOK	Norwegian Kroner
NOU	Official Norwegian Reports
NPR	Norwegian Patient Registry
NSD	Norwegian Social Science Data Services
OUS	Oslo University Hospital
RHA	Regional Health Authority
SEK	Swedish Kroner
SPSS	Statistical Package for Social Sciences
SSB	Statistics Norway
UK	United Kingdom
VIF	Variance Inflation Factor

1. INTRODUCTION

An interest in focusing on coordination and its improvement is neither new nor foreign to health care sectors around the globe. Norway is no exception, and it has proven to be an ongoing challenge and concern. This concern has recently resulted in a white paper, defining three main challenges facing Norwegian health services, accompanied by suggestions for five preliminary steps for meeting those challenges in what has been called "The Coordination Reform"(Norwegian Ministry of Health and Care Services 2012). This reform focuses on the coordination of primary and secondary health services with an overarching goal for patients to receive the "proper treatment – at the right place and right time" (Norwegian Ministry of Health and Care Services 2009). In this context, coordination is the integration of different levels of healthcare and organizations to improve delivery of services. The policies resulting from this reform are in an ongoing implementation phase after becoming effective at the beginning of 2012. A variety of effects and changes has already been and will continue to be observed as a result of these measures.

This study aims to examine the effects, likely induced by the change in municipal financial responsibility for patients ready for discharge, on both municipal and hospital behavior and decision making one year after implementation of the policies suggested in the Coordination Reform paper. Data is used from before and after reform implementation, with special emphasis given to the municipality of Oslo. More specifically, this analysis seeks to explain the variations in delayed discharge for those somatic care patients who will require municipal services upon being discharged by characteristics of the patients, the hospitals and the city districts.

The primary function of this before-and-after descriptive evaluation is to answer the following questions of interest:

1. Is there a significant difference between 2011 and 2012 (one year before reform implementation and one year after) in the periods of time from discharge ready notification to actual discharge?

2. If there is a significant difference, what explains or predicts the variation in the periods?

The study also aims to find probable explanations for observations made in answering these questions by looking at various differences among the city districts of Oslo. This will be done by statistically testing different explanations for any observed variation between different periods of time related to a patient's discharge date using multiple independent predictor variables. I anticipate there to be a decrease in the extent of delayed discharge as the municipality experiences an increase in the relative costs for providing hospital care for patients ready for discharge.

One of the three major challenges, that was outlined in the paper, is "the patients' needs for coordinated services are not being sufficiently met" (Norwegian Ministry of Health and Care Services 2009). This specifically relates to the municipality's responsibility for and involvement in health services that are required after hospitalization. Two of the five preliminary steps outlined in the reform address the future role of municipalities and their associated financial incentives regarding their involvement in providing health services.

The most important financial aspects, resulting from the reform paper, are seen in one new law and one new regulation concerning the municipal financial responsibility for patients ready for discharge; Law on Municipal Health Services (Health and Care Act) and the Regulations on Municipal Co-funding of Specialist and Municipal Payments for Patients Ready for Discharge (Norwegian Ministry of Health and Care Services 2011b, a).

A municipal expense of 4,000 Norwegian Kroner (NOK) per day (paid to the hospital) for each day a somatic care patient stays in the hospital after being cleared for discharge (delayed discharge) is one of the important financial results of these new provisions. The municipalities also have to pay 20% of each somatic medical (non-surgical) DRG (diagnosis related group) for each hospital patient (Norwegian Ministry of Health and Care Services 2011a). A maximum of 30,000 NOK in co-financing has been allocated for each hospital admission, and additionally 5.6 billion NOK given to the municipality from the national government to offset the new financial burdens for 2012.

The goal of these new financial regulations is to incentivize the municipalities to evaluate how resource utilization affects healthcare, as well as, the appropriateness of use of resources (Norwegian Ministry of Health and Care Services 2009). The delayed discharge provision results in the municipality having an interest in minimizing the length of hospital stay for those patients for which it is responsible. Therefore, the municipalities will be required to focus on coordinating short- and long-term care opportunities for those that require such when

deemed ready for discharge. Preventative measures, as well as greater focus on primary, rather than specialist care, will also become paramount to the municipality in response to their responsibility for admission/DRG costs.

It was expressed in an official national government report, NOU 2005:3, that there may be a disagreement between when the specialist level of health care determines a patient is ready for discharge and the municipalities' readiness to accept that patient (2005:3). Based on that, the report made a suggestion for the municipalities and the health enterprises of the regional health authorities (RHAs) to create agreements for the coordination of delivery of services to patients.

With a focus on decreasing expensive specialist care and providing care at the more economical outpatient and municipal levels, the average length of stay was decreased to 5.2 days in 2004 from 7.5 days in 1989. Additionally, the overall number of hospital beds also saw a decrease between 1990 and 2003 going from 16,000 to 14,000.(Johnsen 2006) This translated to more patients receiving in-home and municipally based primary care.

1.1 Bed blocking and delayed discharges

The terms 'bed blocking' and 'delayed discharge' have no conventional or agreed upon definition, but they both are and have been used synonymously to explain each other (Hall and Bytheway 1982). The term 'bed blocking' originated in the United Kingdom and the term 'delayed discharge' in the United States and Canada (Manzano-Santaella 2010). Regardless of word choice, both were, and still are used to describe when a patient no longer requires acute hospital care (is ready for discharge) but remains in the hospital due to any variety of reasons. Therefore, when a patient remains in the hospital, their discharge has been delayed (delayed discharge) and this leads to them occupying a bed, and blocking someone else who requires acute hospital treatment from receiving care (bed blocking). Even though this is the general concept, the exact definition and accepted terminologies used in practice are still debated. Going beyond the debate of semantics, these phenomena have been associated with two prominent issues: a lack of timely provision of social services, leading to a failure in the planning process and shortages in alternative care options (Manzano-Santaella 2010). Within decentralized and semi-centralized models where different responsibilities are held at different levels, like that in Norway, certain characteristics emerge. For example, there is an incentive for the municipalities to let patients stay in the hospital because they do not pay for the hospital services until discharge. Delayed discharges and blocked beds are of concern not

only because they prevent others from receiving care, but longer hospital stays can lead to complications and other nosocomial conditions and treatments provided in a hospital are, by far, more costly than treatments and services provided in other settings (Hauck and Zhao 2011).

In line with the aforementioned lack of timely service and care shortages, the financial measures implemented as a result of the coordination reform for discharge ready patients is directly tied to utilization of hospital beds and the issues of delayed discharge and bed blocking. There are a number of ways to address these issues. Four of the most important being adding more beds, introducing initiatives to reduce admissions, offering increased day services, or having earlier/more efficient discharges which usually incorporates the use of intermediate care facilities and transfers to social health care establishments (Manzano-Santaella 2010). Proper coordination and planning for patient discharges, especially those moving on to additional healthcare services, is crucial for patients to move smoothly through the system. This system (at least in Norway) is comprised of many elements including primary and secondary specialist care, long- and short-term care facilities, including nursing homes and rehabilitation centers, social and home care, and acute hospital care. Acute hospitalizations account for only part of the broader healthcare services picture but are a crucial component in the overall system. The financial policies resulting from the coordination reform seek to mitigate this coordination issue; however, they are not the first financial provisions used to address this issue in other countries or Norway. Three of the four ways to address the issues (all those except adding more beds) were employed or targeted, in theory, by the financial incentives.

Using financial incentives to motivate improvement has been seen in a number of countries including Sweden, Denmark, and the United Kingdom (UK). Sweden implemented legislation, at the beginning of 1992 called the 'Elderly Reform' with a provision that made the municipalities responsible for payment for those patients who stayed in the hospital longer than 5 days after being identified as discharge ready; 1,800 SEK per day for short-term hospitals and 1,300 SEK per day for short term geriatric departments (Styrborn and Thorslund 1993). Starting in 1993, Danish counties, responsible for hospital care administration and financing, were allowed to charge the municipalities, responsible for post-discharge care administration and financing, on a per diem basis for patients who remained hospitalized for a reason associated with waiting for a municipal service, yet this is not mandatory (Colmorten, Clausen, and Bengtsson 2003). In 2004, the UK's Community Care Act, a policy which was

introduced in 2003 and based on the Swedish model, became effective allowing the hospitals to charge the social services departments a daily fee for patients (excluding children, maternity patients, mental illness admissions and palliative care) who remained hospitalized for more than 48 hours after medically fit for discharge (Bryan 2010).

Norway, historically, has also implemented similar policies. In 1999 a regulation that was passed the previous year and legally based on a 1982 municipal health services law (enacted in 1984) stated that the counties (still in charge of the hospitals at this time) may require payment from the municipalities for patients who remain in the hospital after being ready for discharge (Norwegian Ministry of Health and Care Services 1982). The charges were not allowed to begin until 14 days after the municipality had been notified in writing that a patient was ready for discharge and, according to the regulation, the price per day was to be determined by the Ministry of Health and Social Affairs (Norwegian Ministry of Health and Care Services 1998). A special set of criteria stating what must be included and documented in the medical record before a patient is deemed ready for discharge was also outlined in the regulation (See section 2.4.1). The 1999 regulation was modified by a 2002 regulation, that became effective in 2003, changing the number of days for when payment could begin from 14 to 10 (7 for the municipality of Oslo) and stating that the municipalities should be familiar with the previously set pre-discharge hospital documentation criteria (Norwegian Ministry of Health and Care Services 2002). The latest changes, effective January, 1 2012, are seen in a new law and regulation that have resulted from the Coordination Reform paper.

Though Norway was not the first country to implement a financial incentive to address the issues of delayed discharge and bed blocking, it is the first to make the financial responsibility mandatory and effective on the very same day a patient is considered ready for discharge.

1.2 Theory

The main objective of this thesis is to examine differences in delayed discharges, as well as possible demographic and geographic variations to explain these differences. Additional variables of interest are payment days and the discharge deadlines used to determine them. Demand and supply factors will also be added to the analysis to provide a more complete picture. I will specifically concentrate on analyzing the variations between city districts.

Different possibilities for explaining the variations in delayed discharges exist. Characteristics such as socioeconomic, geographic, demographic, as well as supply and demand factors may be of significance.

Delayed discharges will be analyzed using economic models of supply, demand and price/cost shifting. The basis for the theory of this study will be developed using a demand model framework using these terms. The model framework will describe the relationships between health, socioeconomic status, need, supply and consumption of health care services. This sets the stage for understanding the price/cost shifting theory that is used to arrive at a general hypothesis about utilization of services that affect delayed discharges.

There are two key players in the collaborative efforts that are ultimately responsible for the decision making that also affects delays in patient discharges. One of these two players, the hospitals, upon patient admission, initially make an assessment determining that patient's future need for additional services after hospitalization and later notifies the other player, the city district, once a decision about the planned or anticipated discharge date has been made. After receiving a notification, the city districts, responsible for primary care within the municipality, make an assessment resulting in a decision about their ability/willingness to accept and provide services for the patient who is to be discharged. These decisions made by the hospitals and districts are influenced by different factors which can be evaluated and used to form hypotheses about the decision making process' effect on discharge delays.

1.3 Data and methodology

Data for this study is collected from Gerica and Statistics Norway (SSB).

Gerica is the electronic documentation system used throughout the primary healthcare sector in Oslo and used in this study to provide geographic and demographic discharge data, as well as, important dates corresponding to the discharge process. This database was used as the main data source for the project.

Statistics Norway provided the supply and demand variable data concerning nursing care, elderly population proportion and immigrant population percentage.

The information used from Gerica consists of data for patient discharges requiring municipal services in 2011 and 2012. The discharges were grouped by age, gender, location type patients were sent to upon discharge, hospital and city district. The Gerica data was

continually checked for quality and accuracy before analysis began. Additionally, the data for the two years was merged and the supply and demand variables were added. Using this merged and combined dataset, it is possible to conduct an analysis of the differences between years and variation primarily in delayed discharge and secondarily, payment obligations.

An initial quantitative and descriptive assessment of the data was performed followed by multi-variable regression analyses investigating relationships among the variables. The models investigated variations in delayed discharge based on the research questions and hypotheses.

1.4 Thesis structure

This introduction included a brief description of delayed discharge and bed blocking with a policy review. In chapter two, the Norwegian health care structure, the municipality of Oslo and white paper no. 47, "The Coordination Reform," are broadly discussed with more specific detail given to parts directly relating to this study. The theoretical foundation follows in chapter three. Chapter four contains the data and methods used in the analyses followed by results in chapter five. The paper then concludes with two additional chapters; discussion and conclusion.

2. BACKGROUND

2.1 Norwegian health care structure and organization

Much like the three level government structure of Norway, consisting of national, county council and municipal levels, the healthcare sector is comprised of national, regional and local levels. The national level of healthcare is represented by the Ministry of Health and Care Services. The national level does not actively participate in the provision of care, like that of the lower two levels, but rather maintains an oversight and planning function. As explained by Jan Johnsen, "the Ministry of Health and Care Services (Helse- omsorgsdepartementet) outlines national health policy, prepares major reforms and proposals for legislation, monitors their implementation and assists the government in decision-making" (2006, 16). "[It] is responsible for administering the following services: primary health care, specialized health care, public health, mental health, medical rehabilitation, dental services, pharmacies and pharmaceuticals, emergency planning and coordination, policies on molecular biology and biotechnology and nutrition and food safety" (Johnsen 2006, 16). The ministry is also responsible for the oversight of a number of secondary agencies. Under the Ministry of Health and Care Services are four regional health authorities (RHA); North, Midland, West and South East (result of a merger of South and East in 2007) as seen in Figure 1.

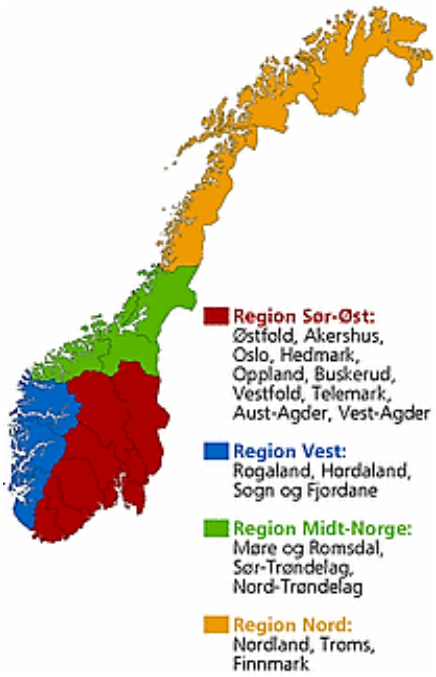

Figure 1. Regional Health Authorities (RHAs) of Norway (Source: Statistics Norway)

These RHAs own 18 independent legal bodies known as local hospital trusts or enterprises that are responsible for providing specialist care, which includes hospitals (see Figure 2). The RHAs took over administrative control of hospitals when they were transferred from the 19 counties in 2002 (Johnsen 2006, 136, Hagen and Kaarboe 2006). The lowest level of care and services, primary care, is provided at the local level by the current, 428 municipalities (2013). This level works to improve population health, treat diseases, and address health issues that do not require hospitalization (Johnsen 2006, xiv).

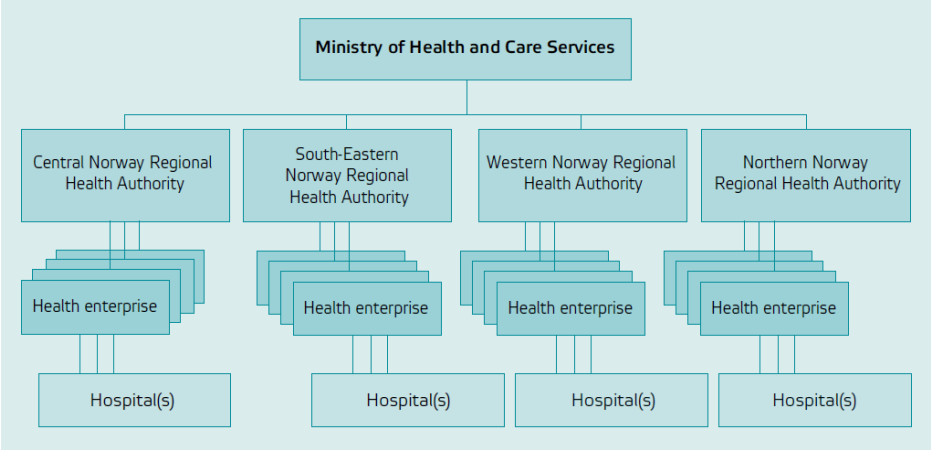

Figure 2. Organizational structure of the regional health authorities, health enterprises, and hospitals in Norway (Source: Ministry of Health and Care Services)

2.1.1 Specialist/hospital secondary care services

The Hospital Act of 1969 made a unified system for specialist/hospital level care. This Act made the 19 counties responsible for planning, constructing and managing hospitals for their respective populations. In 2002, this organizational structure changed and the central government, by way of five regional health authorities (later changed to four in 2007 with the merger of South and East), took over hospital oversight via individual health enterprises (See Figures 1 and 2) (Johnsen 2006). This marked a change from what was being called a decentralized NHS model to a semi-centralized NHS model because the different levels of care were split between different levels of government (Hagen and Kaarboe 2006). The RHAs are funded by global budgets, out of pocket payments and activity based financing. Somatic hospital services are funded via DRG activity based financing (See Figure 3).

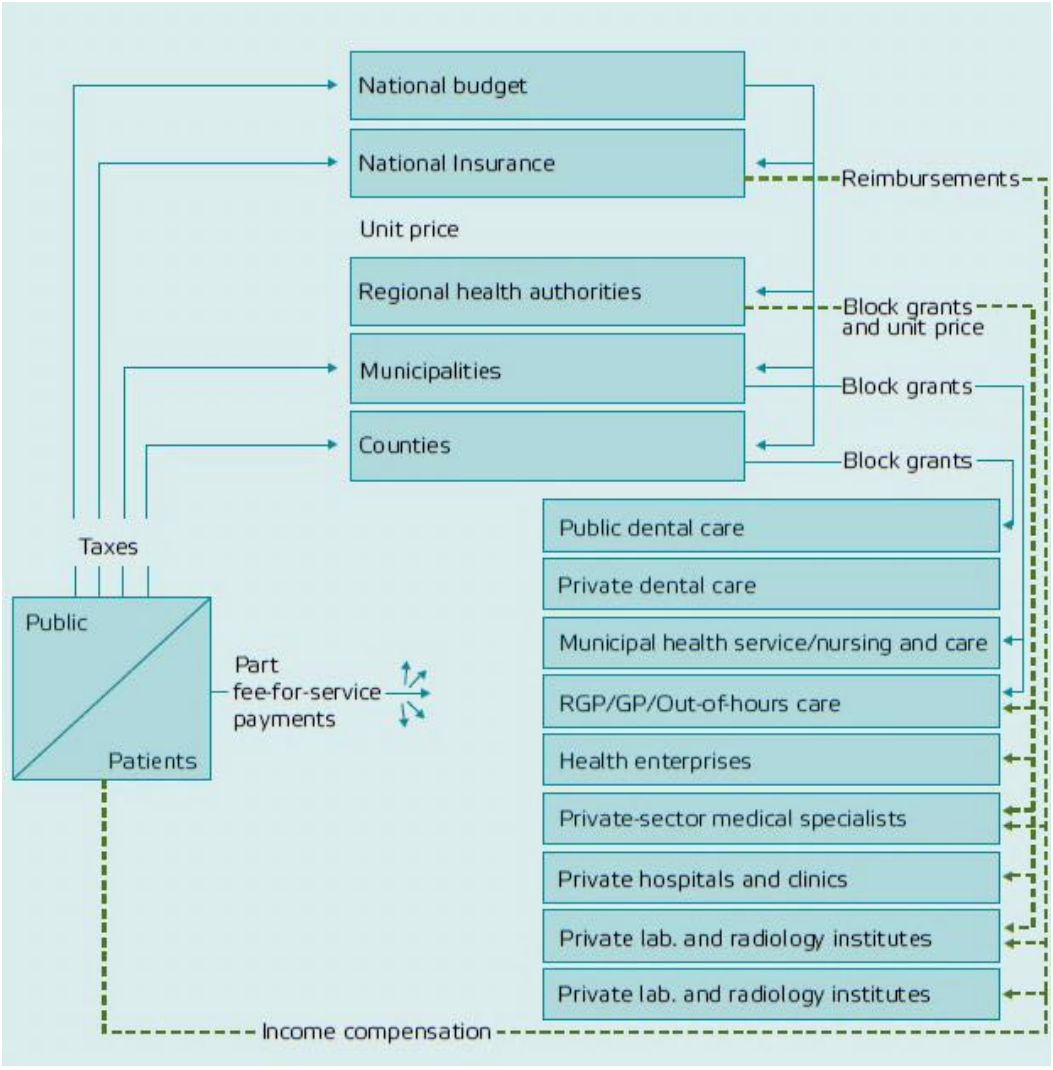

Figure 3. Norwegian healthcare financial flowchart (Source: NOU 2005 on health service coherence)

2.1.2 Primary care services

Primary care services became the responsibility of the municipalities in 1984 after the introduction of the Municipalities Services Act of 1982. The municipalities also took over the responsibility of nursing home care from the counties in 1988 and in 2001 a general practitioner (GP) list system was introduced. With the introduction of the list system, all citizens were given the right to choose to participate giving them the ability to choose a GP, switch lists up to two times per year, and seek a second opinion from another provider (Johnsen 2006).

The primary health services are mainly funded by block grants from the national government provided by taxes (See Figure 3). These primary care services include general medical services, the general practitioner (GP) scheme, emergency first aid, physiotherapy, nursing home care and rehabilitation, as well as other long- and short-term services.

Patients' homes and nursing homes are the most typical places for rehabilitation services to be conducted, but it is not uncommon for municipalities to purchase beds in private institutions for long-term institutionalized rehabilitation needs (Johnsen 2006, 107).

Long-term care is broken down into three different sub-sections regulated by two different Acts; home-based care and sheltered houses regulated by the Social Services Act, and nursing homes by the Municipalities Health Services Act (Johnsen 2006, 108). There is a priority to have the greatest efforts aimed at allowing people to remain in their homes receiving care for as long as possible. In 2001, patients were afforded the right to an individual treatment plan if they required long-term care and coordinated services by the Act on Patients' Rights (Johnsen 2006, 132).

2.2 Municipality of Oslo

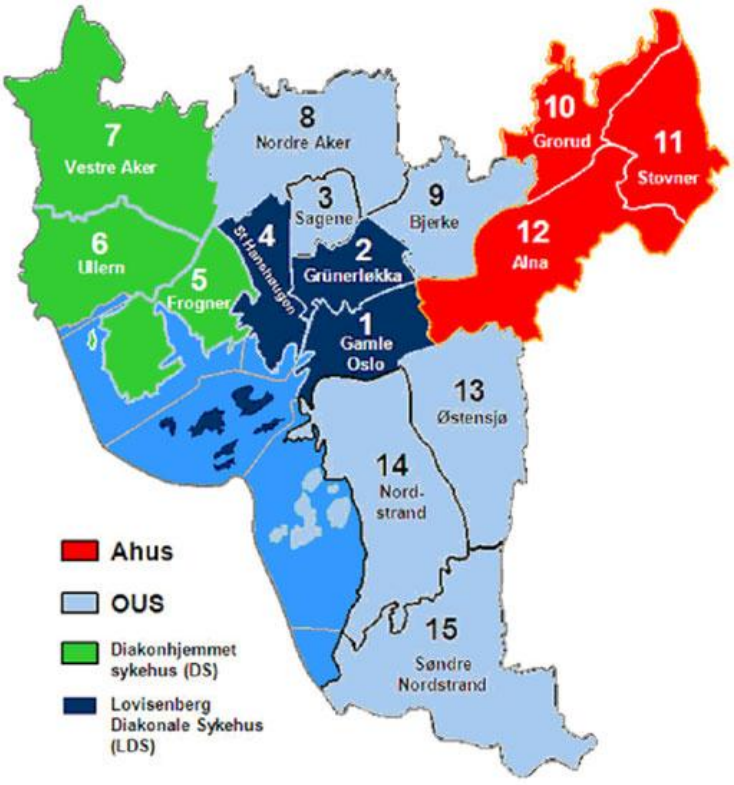

Figure 4. Municipality of Oslo map with hospitals (Source: OUS, www.oslo-universitetssykehus.no)

In addition to being the largest city in Norway, Oslo is one of the 19 Norwegian counties. It is also the most densely populated city and county in the country. The municipality is made up of 15 districts, each with a corresponding primary hospital as seen in Figure 4. Districts 1, 2 and 4 (Gamle Oslo, Grünerløkka and St. Hanshaugen) are the responsibility of Lovisenberg Diakonale Hospital (sykehus). Districts 5, 6 and 7 (Frogner, Ullern and Vestre Aker) are the

responsibility of Diakonhjemmet Hospital (sykehus). Districts 3, 8, 9, 13, 14 and 15 (Sagene, Nordre Aker, Bjerke, Østensjø, Nordstrand and Søndre Nordstrand) are covered by Oslo University Hospital (OUS). A merger took place in 2009 to form OUS. This combined three university hospitals: Rikshospitalet (The National Hospital) (including Radiumhospitalet (Norwegian Radium Hospital), Ullevål University Hospital and Aker University Hospital into one central institution. The remaining three districts within the municipality of Oslo, 10, 11 and 12 (Grorud, Stovner and Alna) are the responsibility of Akershus University Hospital (Ahus) located in the municipality of Lørenskog in the county of Akershus, which is the county surrounding the municipality and county of Oslo. These are the major hospitals responsible for the specialist health care for the municipality of Oslo, though there are additional smaller hospitals within the municipality.

The responsibilities and coverage areas of the hospitals function as a general outline. Different hospitals lack certain services and facilities that others possess. There are special agreements among the hospitals within the municipality for treatment of patients from a district with a corresponding hospital that does not provide the services they require.

2.3 The Coordination Reform

A white paper titled "The Coordination Reform, Proper treatment –at the right place and right time" (Report No. 47 to the Storting (2008-2009)) was presented to the Norwegian Parliament by the Ministry of Health and Care Services in 2009. The paper explained that the Norwegian healthcare system was developing in a way that was unsustainable unless changes were made. One of the main culprits was identified as a lack of coordination resulting in money being spent incorrectly and inefficiently. In this context, coordination refers to the integration of different levels of healthcare and organizations to improve delivery of services. Suggested solutions were proposed with a major focus on the municipalities and their role within the sector. The overall structure of the report was an outline of three main challenges facing Norwegian health services followed by five preliminary suggested steps for meeting those challenges. The Parliament considered the report's recommendations and followed up with relevant policy initiatives described in section 2.4.

2.3.1 Challenges and Recommendations

The three outlined challenges are:

- Patients' needs for coordinated services are not being sufficiently met.
- In the services, there is too little initiative aimed at limiting and preventing disease.
- Population development and the changing range of illnesses among the population.

The five suggested steps are:

- A clearer role for the patient.
- New role for municipalities in the future.
- Financial incentives.
- Developing the specialist health care services to enable them to apply their specialized competence to a greater extent.
- Facilitating better-defined priorities.
  (Norwegian Ministry of Health and Care Services 2009)

One of the challenges, 'patients' needs for coordinated services not being sufficiently met,' along with two of the suggested steps, 'financial incentives' and a 'new role for municipalities,' are specifically related to the municipality's responsibility for and involvement in health services required after hospitalization. As such, these sections of the reform are directly relevant to this study.

The main goal of the coordination reform suggestions was to create economic incentives that support needed changes and provide a basis for excellent patient services and cost effective solutions. When the reform was introduced, it was asserted that the healthcare system did not sufficiently support continuity of patient care through collaboration between the municipalities and specialist health services, nor give an incentive to seek appropriate facilities and cooperation arrangements.

2.3.2 Challenges

This section highlights some of the important issues cited as motivation and justification for the five suggestions provided in the white paper.

There were an estimated 150,000 hospital bed days utilized by elderly patients ready for discharge in 2007. One out of every five elderly patients was readmitted within 28 days of the original discharge and more than one out of four were readmitted within two months. New users of services saw a readmission rate of one in every three. According to the Coordination Reform paper, several Norwegian studies estimated that the number of unnecessary hospital admissions was significant with an overall estimate of about 400,000 somatic hospital days that could have been avoided if alternative services were available within the community. The report also estimated that the number of bed days for patients ready for discharge and unnecessarily hospitalized patients would increase from the (then) current 550,000, accounting for one in every seven hospital days to 900,000 by 2030, accounting for one out of every four to five bed days. It was indicated that this was a conservative estimate because it

assumed that the number of possible bed days in the hospitals was a constant factor and did not account for the rapid increase in hospital usage by the elderly in the previous decade.

The report also presented data from the first eight months of 2008 showing that 19,000 stays, accounting for 145,000 bed days, were credited to patients who were ready for discharge. A survey in the autumn of 2008, among the regional health authorities, also estimated somatic bed days for patients ready for discharge to be 150,000. It was further concluded that the hospital length of stay (LOS) was directly affected by physician coverage in nursing homes, coverage levels of institutions, and number of homes for the elderly (over 80 yrs.). Smaller local hospitals and municipalities over 100,000 were associated with the greatest number of bed days for patients ready for discharge. It was noted, however, that there is wide variation among hospitals.

At the time of the report, and as seen in section 1.1, the payment regulation was such that health authorities were able to request payment from the municipalities starting ten days after the municipality was notified in writing that a patient was ready for discharge unless another agreement was made (7 days in Oslo).

Based on 2007 financial data from the health authorities and the hospitals, about 40 million kroner was spent on discharge ready patients. The average daily cost per hospital bed was 5,000 NOK whereas the cost of an intermediate nursing home department was only 1,575 NOK and only 1,100 NOK for a long-term nursing care bed. At the time of the report, there were no reliable KOSTRA (national information system with data on municipal and county authorities' use of resources) figures for the net per day expenditures of municipal institutions for the elderly and disabled. The net operating costs, excluding capital costs in 2007 ranged from 1,100 to 1,800 NOK per day depending on the size and type of the nursing home. This being the case, the annual cost of bed days for discharge ready patients was 725 million NOK, based on average daily cost. If those days had been spent utilizing intermediate nursing home care units, using the average daily costs above, the annual cost would have been about 220 million NOK. It is noteworthy that there is also a disclaimer given in the paper that the figures are estimates and therefore subject to uncertainty.

The white paper referenced a letter, from the national board of health to the health ministry in December 2008, stating that resources were not sufficiently allocated for rehabilitation after treatment, nor was enough spent on needed home care after expensive rehabilitation programs were completed. A problem analysis was also referenced indicating there were few, if any,

systems in Norway that effectively distributed the tasks among the different health care sectors and between the entities within them. It went on to say, this, coupled with a lack of municipal management after patients were discharged, has resulted in the healthcare entities having different systems that are quite fragmented.

Some of the services are provided in hospitals, not because they must be done there, but because the infrastructures have not been put in place that enable the municipalities to perform them, and/or because there is frequently either no cost or a reduced cost burden on the municipality to refer the patients to the hospital and let them be taken care of there.

One of the assumptions for reducing the use of specialist care is that the municipality is able to facilitate and increase opportunities for timely discharge from hospital.

2.3.3 Financial incentives

The information in this section describes the financial incentives suggested in the coordination reform paper.

The goals and rationalizations, presented in the Coordination Reform paper, were that the municipalities would be encouraged to look into ways to achieve better health outcomes either through better use of resources currently used or better use of new ones. This included more effective and efficient use of hospitals. In other words, the proposed incentive schemes were aimed at stimulating local involvement relating to the issue of coordination.

Throughout their efforts, evaluating and proposing the coordination reform, the government paid special attention to the arrangement of financing systems and their effect on both the bodies that develop the services and the services themselves. The overall assessment was that the then current system was not conducive to the development of structures and organization of services that would adequately and appropriately provide for patients needs in a comprehensive manner. Nor did it provide for incentives to find cost-effective solutions. The ministry's opinion was that the funding system was not structured well enough to sufficiently support effective collaboration between municipal healthcare related functions and specialist health services.

The ministry believed that a stronger integration in funding was the best way to promote collaboration and integration and this could be best achieved by three main actions: introducing local co-financing of specialist healthcare services, transferring the financial

responsibility for discharge ready patients from the hospital to the municipalities, and a greater degree of block funding given to specialist healthcare services.

The white paper outlined that the government would transfer the financial responsibility for discharge ready patients to the municipalities at the beginning of 2012, ultimately obligating them with payment for patients defined ready for discharge. The aim of the shifted financial obligations for patients ready for discharge was not to function as a punishment to the municipalities for not accepting them, but rather to implement an incentive to increase efforts to do so. With the introduction of the scheme, the municipal sector would be provided with funding that matched hospital costs for caring for patients who are ready for discharge. In principle, they could choose to continue or prolong the hospital stay of these patients, and incur the associated costs. Yet, with this new responsibility, the intention was a financial incentive to establish new or increase existing municipal services and entities that had operational costs lower than the daily fee that would have to be paid for patients ready for discharge. The funds saved, from utilizing lower cost facilities rather than paying for delayed patients, could then be used to further establish other health initiatives.

The extra municipal funding would be financed by the regional health authorities (RHAs) experiencing a decrease in their allocation and the municipality's receiving an increase based on historical data for costs associated with patients ready for discharge. This increase in funding would be allocated through funds from local taxes and non-earmarked block grants.

In addition to the changes in payment regulations for discharge ready patients, the proposal suggested that before a patient can be defined as ready for discharge to primary care, all criteria of a discharge ready patient must be met. This arrangement was based on the assumption that the municipalities and hospitals would collaborate to develop criteria for discharge ready patients and agree on provisions for handling re-admissions. It was suggested that agreements concerning a reasonable time for discharge would have to be made concerning complex and challenging patient groups. Additionally, the discharge summary from the physician, drug information, prescriptions, and reports from all relevant professional bodies must be present at discharge.

Again, it is important to note that the Coordination Reform paper highlighted that the ministry was aware of large differences between municipalities and institutions concerning discharge ready patients and factors that affect length of stay and discharge from hospital. Those factors being hospital location, number of nursing and care homes, physician coverage at nursing

homes, and staffing and expertise for nursing and home care. It was also indicated that this financial change would make the smaller municipalities the most vulnerable, but was suggested this could be minimized through inter-municipal cooperation.

2.3.4 Municipal responsibility (New role for municipalities)

This section references the changes in municipal responsibility proposed in the coordination reform paper.

Two main changes in municipal responsibility were suggested by the Coordination Reform paper; municipal co-financing of specialist healthcare services and municipal financial responsibility for patients ready for discharge, the latter being relevant to this study.

According to the Coordination Reform paper, it was theorized that many patients were likely treated within the wrong level of healthcare, especially certain care and treatment received in the hospitals which could be provided in a better and more cost effective manner within the communities. There were indications this might be due to structural deficiencies in the processing chain between hospitals and community health services, and as a result, waiting times between the hospitals and municipal care became too great.

The paper pointed out that, often times, patients are classified as ready for discharge but remain in the hospital awaiting municipal services. There are also patients who, when considering their medical needs, unnecessarily wind up in the hospital because the municipalities do not have the infrastructure and facilities to meet their needs. It was estimated that in 2007, one out of every seven hospital beds was occupied by a patient who was deemed ready for discharge or who was unnecessarily hospitalized and could have been treated through community services. Accounting for an aging population, it is estimated that by the year 2030 one out of every four or five somatic hospital beds will be occupied by these same types of patients. Additionally, beyond an economic context, this also contributes to long waiting lists because those patients who need specialist services are being bed blocked by those patients utilizing hospital beds unnecessarily.

A major consideration and suggestion of the reform paper for changes in municipal functions was to increase the number of, or improve existing municipal services that can treat patients before they require hospitalization or instead of hospitalization. Additionally, when hospitalization is required, increasing and improving services required after discharge to help minimize the overall period of hospitalization and waiting time once ready for discharge. This

included treatment and rehabilitation services, required after hospitalization, before patients are discharged home.

According to the reform paper, studies show that discharge ready patients in the hospital will be able to get better and less costly services in the municipality. Furthermore, experience shows that establishing observation and post-treatment units within the municipal sector can help to improve the services for the individuals and help prevent hospitalizations and re-admissions.

The proposal for 'patients ready for discharge' was believed to have many benefits. It would enable municipalities to make choices between paying for the patient to remain in the hospital, create other care opportunities and points of care in their own municipality, or develop inter-municipal agreements. The funds saved from utilizing lower cost facilities, rather than paying for patients with delayed discharges, could then be used to further establish other initiatives within the municipality. Increased efforts at the municipal level toward prevention, early intervention, and the right treatments at the appropriate time within the community, will help to reduce the need for hospital admissions and thus reduce the extent of delayed discharge patients. This change puts smaller communities at the greatest risk, especially in terms of the need for expertise, but again, it was believed that this could be remedied by inter-municipal cooperation schemes.

2.4 New Policies

In terms of this study, the most important policy changes resulting from the suggestions of the reform, outlined in section 2.3.1, are seen in the adoption of one new law and one new regulation concerning the municipal financial responsibility for patients ready for discharge; the Law on Municipal Health Services (Health and Care Act)- LOV-2011-06-24-30, and the Regulations on Municipal Co-funding of Specialist and Municipal Payments for Patients Ready for Discharge-FOR-2011-11-18-1115 (Norwegian Ministry of Health and Care Services 2011b, a).The most important subsections of those laws are the following:

> **LOV-2011-06-24-30;** § 11-4 *Municipal financing responsibility for discharge ready patients*
>
> The municipality must, from day one, cover the expenses for patients who are ready to be discharged but who remain in a private or public institution providing specialist health services in anticipation of municipal healthcare services.

The municipality must enter into a cooperation agreement with the regional health authorities for discharge ready patients.

The Ministry may issue further regulations on the scheme's scope and content of the criteria for when a patient is ready to be discharged, including criteria for cooperation between local and specialist health services on discharge ready patients. They will also determine the daily pay rates referenced in the first paragraph and which municipality is responsible for the expenses of discharge ready patients. (2011b)

FOR-2011-11-18-1115; **Chapter 3-Government payment for discharge ready patients**

§ 7 *Assessment of a patient admitted to hospital*

When a patient is admitted to the hospital, the health personnel in the hospital must do an assessment of whether the patient may need care from municipal healthcare services after discharge from the hospital.

§ 8 *Notification to the municipality for hospitalized patient*

If the assessment in § 7 shows that the patient may require help from municipal health care services after discharge, the hospital should notify the municipality of this within 24 hours of admission. If the assessment indicates that the patient is not in need of assistance after discharge, but this changes during the hospital stay, the 24 hour period begins from the date it is determined that such a need exists.

Notification must include:
a) patient's status
b) the estimated progress
c) the expected discharge date

If there will be a need for extensive or prolonged hospital treatment, or if because of the patient's health condition it is not possible to make assessments, pursuant to the second paragraph, within 24 hours after admission, the assessment should be performed and the municipality notified as soon as possible.

The hospital must notify the municipality if there are changes in the expected discharge date or care needs.

§ 9 *Conditions for a patient to be discharge ready*

A patient is discharge ready when a doctor in the hospital considers that there is no need for further specialist treatment. This decision is based on an individual health assessment, and the following points must be considered and documented in the medical record:

a) issue(s) at admission, as indicated by the admitting physician, should be clarified
b) other issues which have emerged should be clarified
c) if certain issues are not resolved, they must be explained
d) an update about the diagnosis, and a plan for patient follow-up
e) the patient's overall functioning, changes from prior to admission, and expected future developments should be indicated

§ 10 *Notification of the municipality for discharge ready patient*

When a patient is defined as discharge ready, see § 9, the hospital must notify the municipality immediately. This does not apply to patients ready for discharge who do not require municipal health services.

§ 11 *Message to the hospital when the municipality can receive patient*

The municipality must, after receiving notice of a discharge ready patient, see § 10, immediately notify the hospital if they can accept the patient. This does not apply if there are circumstances beyond the municipality's control that prevent this.

If the municipality cannot accept the patient, the hospital must be notified when a municipal service is expected to be ready. The municipality must immediately notify the hospital when services are ready for the patient.

§ 12 *Transfer of discharge ready patient from the hospital to the municipality*

The hospital may transfer a discharge ready patient when the municipality has confirmed that a municipal service for the patient is ready.

Upon discharge from the hospital, discharge summaries or equivalent information must be sent to health personnel who need the information to provide appropriate patient monitoring, see § 9.

§ 13 *Payment for discharge ready hospital patients anticipating municipal services*

The municipality must pay for hospitalized discharge ready patients anticipating municipal healthcare services.

Payment obligation arises from the day the patient is declared ready for discharge if conditions from § 8 to § 10 are met, and the municipality has stated that it cannot accept the patient. Payment obligation is also triggered if the municipality has not responded to the notification pursuant to § 10 for discharge ready patients.

The hospital should report that a patient is ready for discharge to Norwegian Patient Register when the conditions in the previous paragraph are met.

The daily rate for stays of discharge ready patients in hospitals is determined in the state budget.

§ 14 *Demand of report*

The municipality may request a statement of the considerations the hospital has conducted pursuant to § 9. The report must contain sufficient and necessary information so that the municipality can verify the judgments made by the hospital.

The normal rules of confidentiality apply for disclosure of information in the previous paragraph.

§ 15 *The financial settlement*

The regional health authorities must ensure that the bill is sent to the municipality for the payment of discharge ready patients who have been in the hospital pending a municipal service, see § 13. (2011a)

2.4.1 Policy Implications

An expense of 4000 Norwegian Kroner (NOK), paid by the municipalities to the hospital for each day a patient stays in the hospital after being declared ready for discharge (delayed discharge), is the primary financial effect of the above provisions. To cover these and the co-financing of specialist care costs, 5.6 billion NOK was given to the municipality from the national government in 2012. Figure 5 shows the changes in funding resulting from the policy reform for coverage of these costs as described in chapter 1 and section 2.3.3.

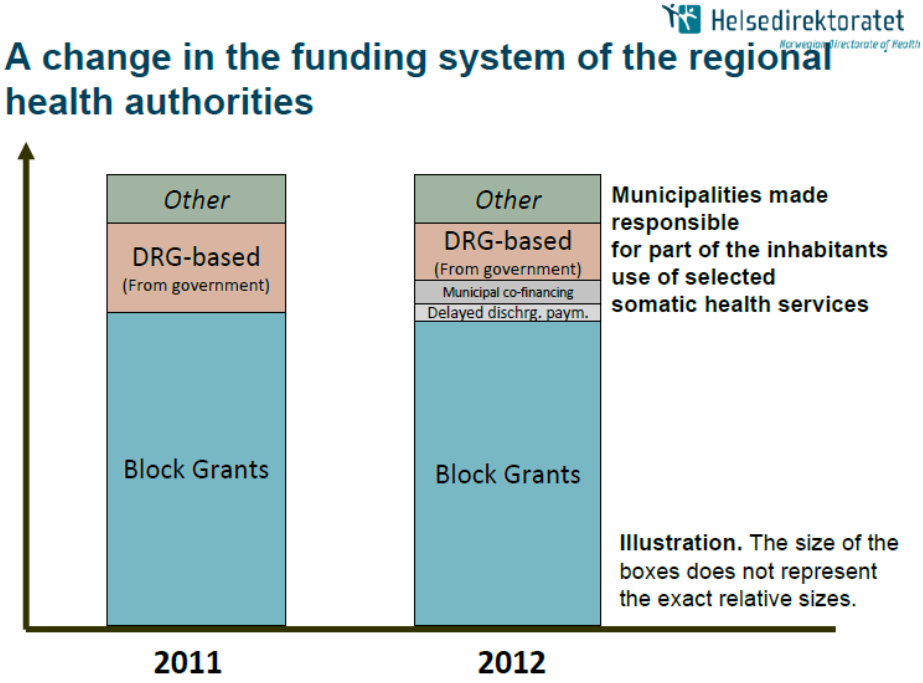

Figure 5. Changes in funding from 2011 to 2012
(Source: Hanssen, Norwegian Directorate of Health 2012)

The changes that have occurred, as a result of the new policies, extend beyond the 4000 NOK daily fee. Mandated intricacies making discharge planning an extensive process that begins within 24 hours of admission are now also in place. The new procedures aim to ensure communication between the hospitals and city districts for patients who are in need of municipal services after discharge from the hospital. An additional aim was establishing a minimum of necessary information to be exchanged between the hospitals and districts when patients are admitted to the hospital, during their episode of care, and at time of discharge.

Prior to 2012 and these new mandates, there were no regulations addressing or mandating minimum protocol leading up to the point when a patient was deemed ready for discharge. Therefore, according to the Coordination Reform paper, very often, counties without a cooperation contract with the hospitals did not plan for reception of a patient before they received information about the date of discharge. This was especially true for the counties which host hospitals, as they used this method to maximize the use of the hospitals' bed capacity.

One of the specifically outlined mandates, existing prior to the new regulations, was the criteria for what must be evaluated and documented in the patient's medical record in order to be defined as ready for discharge. These criteria were first introduced in a 1998 regulation for municipal payment for patients who have finished treatment and are listed as follows:

> 1. issue(s) that were identified by the admitting physician at admission should be clarified
> 2. other issues that have emerged should be clarified
> 3. for issues that are not resolved, they must be explained
> 4. an update about the final diagnosis, and a plan for patient follow-up
> 5. the patient's overall level of functioning, any changes from prior to admission, and expected future developments should be indicated
> 6. if the patient requires specialist healthcare services which are outside the current department's responsibility, it must be ensured that the relevant contact is established, and the plan for follow-up described.
> (Norwegian Ministry of Health and Care Services 1998)

These criteria continued as mandates through the 2003 update and remain in the current regulation, with the exception of number 6, which is no longer listed. The other regulation, in existence prior to 2012, was the number of days before payment could be required after a patient was ready for discharge: 14 days, introduced in 1999 and later changed to ten days (seven for Oslo) in 2003 (1998, 2002). All other national mandates are new as of the beginning of 2012 and described below.

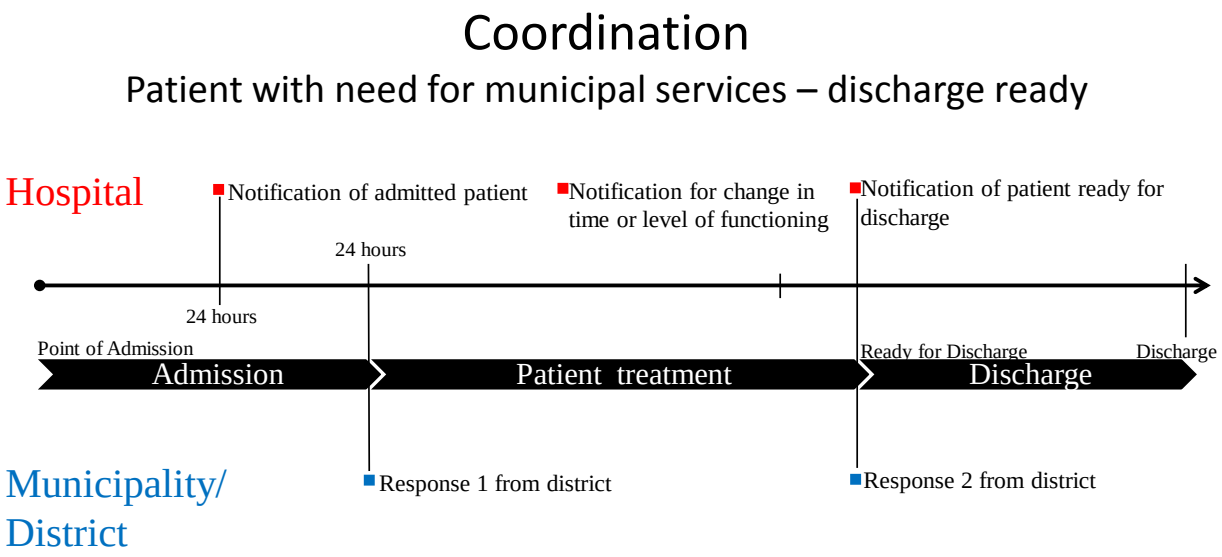

Figure 6. Patient process period from admission to discharge effective January 1, 2012

The hospitalization process has three main stages: an admission, an inpatient period and a final stage with the discharge process (Ortiga et al. 2012). Below is a detailed explanation of those events depicted in Figure 6. The examples given for specific times of day and the mediums used for notification apply specifically to OUS, but the other hospital protocols are very similar if not the same.

Notification of admitted patient

For all patients who are expected to require post-discharge municipal services, the hospital has the responsibility to notify the district/municipality no later than 24 hours after the patient is admitted or as soon as it has been determined that the patient will require municipal services. This notification must include the expected municipal services that will be required at time of discharge. The notification should also contain the following information: patient status, expected progress and expected discharge date. If the initial assessment of the patient indicates that municipal assistance after discharge will not be necessary, but this changes during hospitalization, the 24 hour time limit starts from the point when it is determined that such a need will be required at discharge and the normal procedure is followed. There is an exception for patients who have a permanent place in a nursing home or residential care with day services. In these cases, the notification process does not follow the same routine.

It is also worth mentioning that I have not found a regulation or rule addressing the circumstances if this 24 hour time limit is violated.

*Different hospitals and districts (within Oslo) require different notification mediums. Ahus, Diakonhjemmet and Lovisenberg use electronic notifications, whereas all others use fax.

Response 1 from district

Within 24 hours after receiving notification of admission of a patient who will require additional services, the district should respond to the patient's department. The response must contain the following: confirmation that the initial admission and likely need for municipal services notification was received, a briefing about what municipal services the patient had before admission, a description of the patient's level of functioning and any challenges experienced in the home.

Notification of changed discharge time/functioning level

The hospital is required to notify the district if either the expected discharge date or the patient's level of functioning changes. Additionally, the hospital must inform the district if the need for municipal services no longer exists, if the patient is transferred to another institution or department, or if there is a patient death.

Notification of the district/municipality for discharge ready patients

The hospital should send a written notice to the district when a patient is defined as discharge ready and a discharge time has been set. The discharging physician is required to document the following for patients who are being discharged:

- What issues/diagnoses the patient was admitted with
- If there are other issues encountered during the stay
- If the described issues are resolved or not
- An explanation for any unresolved issues
- The patient's discharge diagnosis and overall level of functioning
- Assessment of expected future developments and plans for follow-up
- Needs/plan for referral to other specialists
- Other issues/needs for rapid follow-up by a GP

The date when the patient is discharged ready should also be clearly stated.

The deadline for notification

As a general rule, notifications of discharge ready patients should be sent as early as possible. The responsible parties should try to notify the municipality as early as possible on the day before the patient will be ready for discharge, preferably before 14:30 Monday to Friday and the last working day before any holidays. If the patient has a need for new or changed services and is reported discharge ready on a Saturday, Sunday or a public holiday, and this is not

known or reported to the municipality/district before 14:30 on a Friday or the last working day before a holiday, the municipality/district is not committed to providing feedback on the discharge or to receiving the patient until the next business day.

Discharge to an unchanged level of care with stay less than 48 hours

For stays shorter than 24 hours and admissions and discharges during the weekend, telephone calls are used for communicating the time of discharge and follow-up requirements, provided that the patient's care needs have not changed significantly from pre-admission. When the discharge time is determined, the municipal/district is notified. An effort should be made to conduct discharges during the day and be arranged in coordination with the municipality/district.

If a patient is admitted to the hospital from a municipal short-term, rehabilitation or intermediate service, they may be discharged back to that institution within 48 hours of being admitted, if the required documentation from the discharging physician is complete. The discharge arrangements are made between the hospital and the institution from which the patient was admitted. If the hospital expects that the stay will last more than 48 hours at the time of admission, the normal procedure is followed.

Discharge for new or changed care level

If a previously announced discharge is moved up, the municipality should be notified no later than the 14:30 the day before discharge. The municipality shall be notified immediately if a discharge is postponed. The hospital cannot discharge a discharge ready patient before the municipality/district has confirmed their acceptance. The hospital must prescribe any necessary patient transport and strive, as much as possible, to see that patients arrive to their destination before 18:00 (14:00 on weekends). If arriving after 18:00, the hospital must call the nursing home/home care to clarify they will receive the patient before transport starts.

Response 2 from district "Received notice of discharge ready patient"

Immediately after receiving notification of a discharge ready patient, the district should contact the hospital by phone. The phone call acts as a confirmation that the district can receive the patient on the discharge ready date. If the district cannot receive the patient on that date, the date when the district can receive the patient must be given. The hospital should provide the district with relevant information related to the discharge and possible measures to prevent re-admission.

3. THEORY

The shift in financial responsibility and changes in funding noted in chapter 2 can be used to make predictions about the changes I will likely see in the data. These predictions can be developed through understanding the relationships among needs and supply and demand. Additionally, shifts in relative costs/price can dictate municipal decision-making for accepting patients and patient characteristics and status affect the hospitals' decisions to deem patients ready for discharge.

3.1 Needs and demand

The needs of individuals are the main starting points for assessing the overall need for health services, including the need to stay in the hospital. Due to the subjective nature of what defines a need, this can be difficult to quantify. Individual need is commonly associated with health status and current medical technology determining people's capacity/ability to utilize health services (Sutton et al, 2002; cited in NOU 2008:2). Health status and one's ability to benefit from health services will also vary due to factors such as age and socioeconomic status. Figure 7 provides a schematic representation of the relationship between health, socioeconomic status, need, supply and demand of healthcare services.

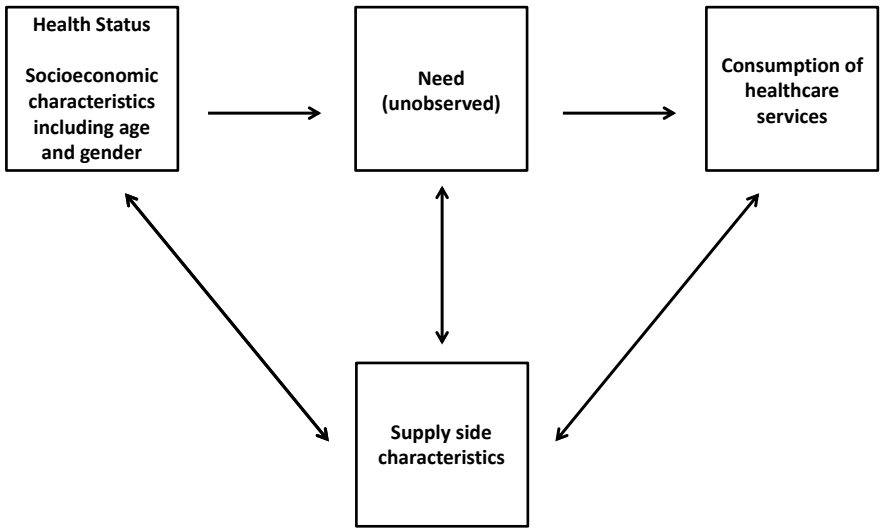

Figure 7. The relationship between health status, socioeconomic characteristics, need, supply and consumption of healthcare services (adapted from (NOU 2008:2))

A need for healthcare results from injury, disease or illness and thus, a change in health status is an underlying variable for healthcare needs. Socioeconomic factors including age and gender can affect the need for healthcare either indirectly by impacting health status, or directly by personal characteristics such as old age. At the same time, need can help explain

the consumption of health care, including hospital care and length of stay in hospitals. Need is a factor that can create demand for services and when demand is greater than supply, consumption is restricted to the level of supply. On the other hand, if there are no supply side restrictions, consumption will characterize need. Determinates of supply can also affect need which, in turn, has an effect on consumption. Need and demand can be reduced by providing curative and preventive services, yet new technological advances can create new, previously unrealized demand (NOU 2008:2). It should also be noted, potentials for social consumption of healthcare and defensive medicine occur when treatment or evaluations are provided even though they are technically not medically necessary. A simplified expression of the relationship between the factors is as follows (NOU 2008:2):

Need = demand, if no restrictions in supply and perfect information
Demand = consumption, if supply is greater than demand

Based on these relationships, differences in expected individual needs can be explained by differences in individual characteristics such as age, sex and social factors. These demographic characteristics can then be used as the basis for allocation of public funding. The resources allocated for publically funded goods, such as health care in Norway, is not unlimited and must be distributed among many entities. Basic microeconomic theory can be applied to explain this healthcare situation. Due to the demographic and geographic differences in Norway even at the municipal district level, the age and socioeconomic structures can vary greatly. Each municipal government is responsible for providing public goods that are funded through block grants from the national government and allocated based on local individual demographic characteristics (Johnsen 2006, 47). Furthermore, budget constraints are used as a regulatory tool and they create supply side restrictions which can translate to limitations in consumption. In theory, with a constrained budget, the healthcare sector would strive for maximum patient utility within those constraints.

3.2 Shift in responsibility and the effects on length of stay

With the new transfer of responsibility from the hospitals to the municipalities and subsequent changes in funding, the municipalities have to find a balance within their budget constraints. We can understand how the municipalities/districts adapt to these shifts in relative costs/prices within a basic demand framework. The legal responsibility for providing public healthcare services within a municipality is shared between two levels; primary care services provided by the municipality and hospital/specialist care provided by the hospital trusts under

direction of the regional health authorities (NOU 2005:3). The municipalities have a budget to cover healthcare costs, whether they are hospital services or their own primary care services. Prior to the implemented reforms, the price paid by the municipalities for hospital care was effectively zero until seven days after a patient was identified as discharge ready. These patient costs were covered by the hospitals whose funding is allocated in the regional health authorities' budgets. Therefore, having no effect on the municipal healthcare budgets, there was a financial incentive for the municipalities to let the hospitals cover the costs for patients ready for discharge or lack of an incentive to begin covering those costs. Beginning in 2012, the costs for hospital care was transferred to the municipalities, beginning when a patient was declared ready for discharge. Even though the actual costs of providing municipal primary care services stay the same, the relative costs of those services become cheaper as the relative hospital care costs have increased. In theory, this should translate to a shift of care within the municipalities; decreasing utilization of hospital care and an increase in use of their own services. In turn, this results in my main hypothesis, that there will be a reduction in overall delayed discharge.

In addition to the endeavor to find a balance in services between the hospitals and municipalities due to budget constraints, decisions made during the process outlined in Figure 6 in the previous chapter have an additional effect on delays in patient discharges. The final decisions that are made before a patient can be discharged from the hospital and sent to municipal services involve a two-step process that is a complex, collaborative effort between the hospitals and the districts. The initial step is taken by the hospitals in setting a planned discharge date, when they feel the patient no longer requires hospital services. This step is followed by the city districts deciding the actual date of discharge based on their willingness/ability to accept and provide services. Ideally, these two dates would be identical and delayed discharges would be nonexistent, but often this is not the case. Many times, there are differences between the two dates (steps) in this process, and this time difference forms the basis of this analysis. The time difference is dependent upon variable factors that affect and influence the choices and decisions made in both steps of the process; the hospitals' expected discharge date, and the date the city district actually accepts the patient (the date the patient is discharged).

The decision made by the hospitals, setting an anticipated discharge date, is dependent on multiple elements such as the characteristics (ex. age, gender) and status of the patient (ex. diagnosis, comorbidities). The districts' decision, dictating the actual discharge date, is also

influenced by multiple factors including patient characteristics, restrictions set by the resources they have at their disposal (ex. budget for nursing care) and the amount of services being utilized by other patients (ex. population over 80). Based on these factors that shape decision making between these parties just prior to patient discharges, I am able to make a prediction that hospitals with differing concentrations of patients with specific diagnoses and comorbidities, as well as those districts with less resource restrictions (greater nursing care spending) and smaller proportions of populations over 80 years will have less delays in their discharges when controlling for patient characteristics (age and gender).

Limitations of the data restrict my ability to fully evaluate all elements of these hypotheses, but this will be returned to more carefully in the discussion chapter.

3.3 Testable Predictions

This section serves as a summary of the testable predictions about the data that I am able to make based on the information found in this chapter. Due to a shift in relative costs, my main prediction is that there will be a reduction in the overall delayed discharge days, resulting from the city districts decreasing their utilization of hospital care and increasing use of their own services. I also predict that those districts with less resource restrictions (greater nursing care spending) and smaller proportions of elderly inhabitants will have less delays in their discharges when controlling for patient characteristics (age and gender). Again, predictions pertaining to the hospitals are not testable due to data restrictions, and will be outlined in the discussion chapter.

4. DATA AND METHODOLGY

Because the implementation and effects of the Coordination Reform are ongoing, some even unrealized, there have been no studies to date that analyze the effects of the new municipal responsibility for patients ready for discharge. At the beginning of 2011, all 15 districts within the municipality of Oslo began to register individual discharge information (when patients were deemed ready for discharge and the time of discharge) in the already existing Gerica database. The makeup of the Gerica data does not allow me to look at the entire stay from admission to discharge. However, the new provisions and the notification within 24 hours of admission requirement, allows me to make an initial assessment explaining the likely errors and variations in the physicians' and hospitals' ability to accurately predict or estimate a patient's discharge. These predictions and estimations made by the physicians and hospitals ultimately enable the municipality sufficient preparatory time so they may accept the patient on, or close to, the day they are ready for discharge. This project is the first to use individual level municipal discharge data to evaluate effects of the municipal financial responsibility for patients ready for discharge in Oslo.

Victor et al. have identified and classified risk factors and factors associated with delayed discharge into a theoretical model of predisposing factors (such as age), enabling factors (such as the availability of social support), vulnerability factors (dependency and co-morbidity), and organizational/administrative factors (referral for services, type of team undertaking assessments) (2000). This framework can be used to organize different risk factors that influence the findings that are relevant to this study. I am able to look at age, gender, city district, hospital and the type of location to which patients are being discharged, and the relationship they have to the days between ready for discharge notification and actual discharge and the days from discharge deadline to actual discharge, as well as, the hospitals' success in predictive discharge planning. I can then take this analysis a step further and evaluate, at the city district level, if the immigrant population proportion, spending on nursing care (indicating the amount of nursing staff) and/or proportion of elderly in the population can further explain the initially evaluated relationships.

4.1 Study Design

This study is a register based retrospective cohort study at the municipal district level in Oslo between 2011 and 2012. The design captures variation over time, as well as demographic and geographic variation. In the analyses, I will analyze the main variable that describes the

period from when a patient is ready for discharge and actual discharge within the municipality of Oslo, which I will call ‘delayed discharge days.’ I will also describe the period from discharge deadline to actual discharge as another variable, which I will call ‘days from deadline.’ In an attempt to account for differences in regulations and definitions, an analysis of a variable for payment days (‘payment days’) will be performed. I use each of the calculated time periods (‘delayed discharge days,’ ‘days from deadline’ and ‘payment days’) as dependent variables in a direct-entry multivariate-least-squares regression analysis along with relevant independent variables explaining potential influencing factors. These independent variables are demographic and geographic influencing factors that include variables such as age, gender, the 15 city districts of Oslo, the 5 main Oslo hospitals, and types of locations to which patients are sent after discharge. I then look at immigration and spending on nursing care as an indicator of nursing staff at the individual district level to explain the initial observations. Additionally, population proportion over 80 years of age will also be analyzed as a demand variable.

The discharges were selected and categorized by year based on the year that the discharge notification was given rather than the year of discharge. This is relevant for those discharge notifications that were given at the end of a calendar and then the discharge took place in the following year.

4.2 Data and limitations

The primary health services within the city districts of Oslo use a computer based documentation system called Gerica which contains demographic information, use and costs of primary health care, time when patients are considered ready for discharge and time of actual discharge. The data found in the registry that can be effectively used for evaluations includes age, gender, hospital, city district, type of location to which a patient was discharged, if a patient died before discharge and if a patient died within seven days of discharge, as well as the date ready for discharge, discharge deadline and date of actual discharge. Unfortunately, Gerica does not include the data of admission which would be ideal for evaluating the entire length of stay and admission to discharge process. Gerica does include a date when the initial notification of admission within the first 24 hours took place, but it is my understanding that even though there was some reporting in 2011 it only started on a wide scale at the beginning of 2012 and the reporting was and is lacking and not heavily enforced.

The reporting is supposed to be continually improving, but due to this lack of reliability this information is not suitable for inclusion in an analysis.

The other source of data is Statistics Norway, which is the central Norwegian statistics bureau. This database contains extensive information on a multitude of subject areas, but important to this study are statistics on population, spending on home care and non-hospital, institutional nursing and percentages of immigrants all stratified by city district.

Limitations of data include concerns about reliability and accuracy, as well as confounding and bias. The nature of the study design, the time frame and comparability problems due to varied users responsible for data entry are also likely limitations. These and other issues will be returned to more carefully and in more detail in the discussion of the results.

Since this thesis does not contain identifiable individual level data it was not reported to Norwegian Social Science Data Services (NSD). General ethical guidelines were still applied throughout the research process.

4.2.1 Ensuring data quality

Numerous steps were taken to ensure the quality and accuracy of the data beginning in the first quarter of 2012. Data previously collected was checked and as new data was collected each month the process continued. According to Heywood and Rohde, visual scanning is the most effective way to ensure correctness, completeness and consistency of reported data (2002, 43). The data was visually checked for missing values, incorrect or out-of-range values, and entries that were logically inconsistent. Completely accurate data is optimal, but in reality, this is highly unlikely. The datasets were carefully reviewed to check for unexpected discrepancies. The most common errors discovered in the data were the result of manual entry input; duplicate entries, missing data and logically inconsistent or improbable entries. As these errors were discovered, they were compiled into queries and then reviewed individually in the Gerica interface. If a determination could be made by looking at each case in the Gerica interface, the corrections were made, if not, those unresolved cases were sent to the districts for review. Before being sent to the districts for review, errors were handled in the following ways. If a duplicate entry was an exact copy of another entry, one was deleted, if there were any differences, Gerica was checked for the accurate entry to retain. Missing data was handled by looking for the information in Gerica, if it could not be found the districts were consulted, and if that failed, the entry was disregarded. Inconsistencies and

improbabilities were checked and if a remedy for the error could be explained with a high degree of certainty, it was manually changed. For example, if a patient was discharge ready on a certain date in 2011 and their discharge date was one relatively close, but the year was 2001, there is a high degree of certainty it was a manual entry error. Another example would be if a patient was discharged a month before they were discharge ready, by looking at other information in the file, the correct month could be changed with a pretty high degree of certainty.

4.2.2 Study Population

All residents that were admitted to a hospital for somatic care and received/applied for municipal primary healthcare upon being discharged between 01.01.2011-31.12.2012 in Oslo (somatic patients registered in Gerica), who had ready for discharge notification, discharge deadline, and discharge dates, were included in this study.

4.3 Empirical model

Correlation and effects of independent variables on the dependent variable are best investigated and analyzed via multivariate regression analyses (Newbold, Carlson, and Thorne 2010, 504-509). Dependent variables are explained by the inclusion of independent variables. Multivariate regression estimates the effect of an independent X-variable on a dependent Y, while controlling for the effects of the other X-variables.

The general empirical model linear equation for multivariate regression is characterized by the following:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots \beta_n X_n + \varepsilon_i$$

Y represents the dependent continuous variable that is being predicted. β_0 is the constant representing the regression intercept and is equal to Y when X is zero. The Betas (β_x) represent the coefficients for their corresponding explanatory variables (X_x). The Beta coefficients measure the effect the changes in the independent variables (X) have on the expected value of the dependent variable (Y) when all other variables are controlled for as constants. ε_i represents the residuals or the difference between the predicted and observed value for Y.

4.4 Variables

A patient's length of stay after being deemed ready for discharge (delayed discharge), which often leads to bed blocking, can be influenced and affected by, but not limited to the

following: the hospital in which they receive care, the city district responsible for their primary care services, and what type of service location to which they are discharged. Additionally, the number of nursing home and home care nurses, the number of immigrants and elderly populations in their respective city district, can help to explain the locational and geographic differences. Other independent variables that were expected to influence discharge time such as age and gender were analyzed.

4.4.1 Dependent variables

The main dependent variable describes the number of days between when the municipality is notified by the hospital that a patient is ready for discharge and the actual date of discharge (delayed discharge days). Another similar secondary dependent variable is the length of time, also in days, between the discharge deadline date and the actual date of discharge (days from deadline), but due to changes in definition and regulations, this variable is difficult to analyze and will therefore be given less emphasis. As presented in section 1.1, in 2011, the deadline for discharge throughout Norway was 10 days (7 days in the municipality of Oslo) after a patient was deemed ready for discharge. With the new reform effective January 1, 2012, the deadline date is the same day the patient is ready for discharge. Exceptions and intricacies are documented in section 2.3.3. In order to give a more complete picture, in light of the definition and regulation changes, a third variable, also with less emphasis, measuring the number of days past the discharge deadline date (payment days), calculated for only those discharges that exceeded the deadline for 2011 and 2012 by removing those who were discharged on or before the deadline will be analyzed. This accounts or adjusts for those discharges that could have negative days between discharge and deadline and looks at only those who could require payment. These dependent variables specifically pertain to discharges for somatic care patients requiring municipal services within the municipality of Oslo. These periods of time were used to form continuous variables of delayed discharge days, days from deadline and payment days. In addition to being evaluated independently, the differences between years, 2011 and 2012, were analyzed. Again, the main focus of the regression analysis will be for ‘delayed discharge days’ due to issues with changes in payment regulations and time period definitions. A timeline referencing the periods described above, with the exception of the 2011 discharge deadline, can be found on page 24 (Figure 6).

4.4.2 Independent variables

The independent variables used in the analyses account for potential explanations of factors that could influence the dependent variables' lengths of time. These factors are selected to represent variables that were outlined in Figure 7 found in chapter 3, page 27. A description and results of the variation in these variables will be evaluated using regression analysis and addressed in the results chapter.

Need/Demand

Age and gender were included in the regression analysis to represent the socioeconomic characteristics that influence need/demand found in the relationship model depicted in Figure 7. Need/demand for services within the districts is also represented by the percentage of elderly inhabitants over 80 years of age and the immigrant population percentage.

Gender

Gender is included in the regression model as an individual case level independent variable found in chapter 5. This variable was coded as a dummy variable of 1 for females and 0 for males and acted to analyze if there are any differences in the time periods with relation to gender.

Age

Age was included in the regression as an individual case level independent variable coded into eight dummy categories. The categories were grouped in the following fashion: 0-17 years, 18-49 years, 50-66 years, 67-74 years, 75-79 years, 80-84 years, 85-89 years and 90-200 years. This acted to analyze if there are any differences in the time periods with relation to the ages of the discharged patients. In the regressions found in chapter 5, patient age groups are dummy variables given a value 1 for their respective age group and value 0 for all others.

Elderly and Immigrants

Additional variables were included in an extended regression as continuous independent variables in hopes of shedding more light on the results of the initial statistics by looking at need/demand from chapter 3. The percentage of immigrants from Africa, Asia, Turkey and South and Central America and the percentage of inhabitants over the age of 80 years in the population of each city district were used to explain the differences noted from previous regressions. The percentages of immigrants and inhabitants over the age of 80, broken down by city district, were obtained directly from statistics Norway. These were used as continuous

variables in the regression models found in the results chapter and served as proxies for the city district variables.

Supply

Hospital, city district, location type to which patients were sent upon being discharged and spending on nursing care were included in the evaluations to aid in explaining variations in supply side characteristics as displayed in Figure 7.

Hospital

Hospitals were included in the regression model as independent variables coded into six dummy categories. Four for the four main hospitals in the municipality of Oslo: OUS Aker, Diakonhjemmet, Lovisenberg sykehus and Ullevål, one for Akershus universitetssykehus which covers three districts, as seen in section 2.2, and another single category for all other hospitals. This acted to analyze if there are any differences in the time periods with relation to the hospital the patient was discharged from. In the regressions found in chapter 5, hospitals are dummy variables given a value 1 for their respective hospital and value 0 for all others.

City District

The 15 city districts of Oslo: Gamle Oslo, Grünerløkka, Sagene, St. Hanshaugen, Frogner, Ullern, Vestre Aker, Nordre Aker, Bjerke, Grorud, Stovner, Alna, Østensjø, Norstrand and Søndre Norstrand were included in the regression model as independent variables coded as dummy variables. This acted to analyze if there are any differences in the time periods with relation to city district. In the regressions found in chapter 5, city districts are dummy variables given a value 1 for their respective district and value 0 for all others.

Discharged to

The locations where patients were sent upon being discharged were independent variables in the regression model coded into eight dummy categories including one category, Annet (others), encompassing all those that did not fit into one of the defined seven. The seven categories were hjemme (home), korttidopphold (short-term stay), korttid samhandling (short-time coordination), korttid intermediær (short-intermediate), korttid rehabilitering (short-term rehabilitation), korttid vurderingsplass (short-term evaluation place), and langtidsopphold (long-term stay). This acted to analyze if there are any differences in the time periods with relation to the type of location a patient was sent to upon being discharged. In the regressions found in chapter 5, the locations patients were sent to upon discharge are dummy variables given a value 1 for their respective location and value 0 for all others.

Spending on nursing care

Just as the immigrant and elderly population percentages served as proxies for the districts to help explain need/demand characteristics, the amount of capital (in 1000 NOK) spent per person on combined non-hospital institutional and home care nursing was used to explain the differences found in previous regressions. A variable for nursing coverage was derived from obtaining the figures for the amount of capital spent on nursing for each district based on nursing type and then dividing by the district's population. Since the spending numbers for 2012 are not yet available, yet unlikely to significantly change from 2011, the 2011 figures were used and divided by the 2012 population numbers. These figures are an indicator for the number of personnel because 80% of spending on nursing care is allocated to human resources. This variable was also a continuous variable in the regression models found in the results chapter.

4.5 Analyses

Descriptive statistics and measures of central tendency were used broadly to describe the dataset. T-tests were used to evaluate the time differences between 2011 and 2012 broadly, as well as stratifying by each independent explanatory variable.

Multivariate linear regression was then employed for the predictive analysis portion of this study to analyze continuous time variables related to delayed discharge with independent demographic and geographic variables, as well as other possible risk factors to measure any associations. In addition, I included variables describing supply and demand of healthcare services within the city districts. The models contain one continuous dependent variable and multiple independent variables used to estimate a dependent variable value. By its nature, multivariate regression allowed me to explore interrelationships among the variables using their respective correlations.

Descriptive functions, t-tests and multivariate least squares regression in Statistical Package for Social Sciences (SPSS) version 19.0 for Microsoft Windows were used to perform each analysis.

4.6 Assumptions

Like any statistical application, certain assumptions must be accounted for to help validate the findings and conclusions in multiple regressions. The assumption of normally distributed residuals applies when working with small datasets. Regardless of which variable is being

analyzed or if the two years are taken individually or separately, the dataset contains over 5,000 cases corresponding to individual patient discharges. A sample of this size is sufficiently large enough to ensure normality, generalizability and validity of the data. Information in this section will include skewness, kurtosis, multicollinearity, auto-collinearity and heteroscedasticity.

Values for skewness and kurtosis are used to evaluate how normal the distribution of data is, also known as normality. Skewness indicates how symmetrical the distribution of the data is, whereas kurtosis indicates the distributional "peakedness." For perfect normally distributed data both values equal zero. If the data is clustered towards the left, at lower values, the skewness values will be positive, and the opposite is true for negative skewness values where the values will be clustered on the right side of the graph or at higher values. If the data is highly peaked with many values clustered in the center with thin tails, the kurtosis values will be positive. Data with excessive extreme values will have negative kurtosis values and be relatively flat. Due to the very large size of the dataset used in this analysis, skewness and kurtosis do not exhibit a major effect. (Pallant 2011)

The dependent variables in each model all deviate from the normal distribution curve to varying degrees. The time from discharge notification to actual discharge, when taken with 2011 and 2012 combined had a skewness statistic of 6.19 and when taken from each year individually 6.69 and 9.29 in 2011 and 2012 respectively (See Appendix I). The three corresponding kurtosis values in the same respective order were 131.21, 133.57, and 176.94. The 2011 and 2012 combined skewness and kurtosis values for the other dependent variable of time from discharge deadline and actual discharge are 3.04 and 57.89 respectively. The two years taken individually had values of 2.20 and 24.09 for 2011 and 8.81 and 184.66 for 2012. Based on those numbers, the residuals of both descriptive variables have positively skewed and highly peaked distribution curves. Due to the data set containing the value 0 when the discharge deadline was met and negative values in 2011 if the discharge took place before the deadline (the theoretical goal of the municipality), many scores are clustered at and around the center of the curve. These non-normal values for symmetry and distribution do not affect the results of the analysis due to the very large sample size. This is explained by the central limit theorem, where the larger the sample size, the more normal the distribution becomes. This minimizes the risk of type I and type II errors. Therefore, even with the observed skewed residuals and pointedness, the distribution of the coefficients should be approximately normal (Newbold, Carlson, and Thorne 2010, 274-280).

To account for potential bias and correlation between the variables, multicollinearity (influence between variables) and auto-collinearity (influence between residuals) diagnostics were performed.

Pearson correlations were performed to check for multicollinearity and give indications as to the strength and direction of relationships among variables. None of the Pearson correlation values exceeded 0.9. Multicollinearity can also be evaluated using Variance Inflation Factor values (VIF) and tolerance test values. The tolerance test gives a value that measures how much of the variability of a specific independent variable is not explained by the other independent variables. The formula used for this calculation is $1 - R^2$ and values less than 0.1 are a strong indication of high correlation with the other variables and should probably be removed. The VIF is simply the inverse of the tolerance value and is therefore recommended that it not exceed 10 (Pallant 2011). For dummy variables that represent categorical variables with three categories or more, like in this study, multicollinearity values can be ignored because if the reference category has a smaller proportion of the cases than another variable, the correlation will inherently be high but not change the outcome of the regression.

Durbin Watson tests were performed to account for auto-collinearity. All regression models had test values between 1 and 3 and they were relatively close to 2 indicating a lack of auto correlation. These numbers can be found in Table 9 in chapter 5 and Appendix II.

An additional consideration was made to ensure homoscedasticity by checking histograms, normal predicted probability (P-P) plots and scatter plots of regression standardized residuals against regression standardized predicted values for heteroscedasticity. Heteroscedasticity occurs if there is variation in the variance of the independent variables or dependent variable. Conversely, homoscedasticity occurs when the variance of the residuals is constant or equal for all dependent variable values. This was observed by the aforementioned relevant plots. The only potential concern is the heavy tailed distributions seen in the normal probability plots (P-P), especially in 2012.

The last assumptions that are made are for normality of the residuals for the dependent variables by checking their respective scatter plots, but this can also be assumed based on the previously mentioned central limit theorem. It is also assumed that the independent variables are known and not random. The last assumption made is that none of the independent variables are linear functions of any other variables used in the equations.

5. RESULTS

5.1 Descriptive Statistics

Table 1. Overall mean days for dependent variables

Variable	Ready for discharge year	N	Mean	Std. Deviation
Delayed Discharge Days	2011	5698	4.83	4.394
	2012	10573	.31	1.259
Days From Deadline	2011	4337	-.78	3.516
	2012	10507	.23	1.246
Payment Days	2011	1206	3.15	3.421
	2012	1136	2.52	2.705

Descriptive statistics for the variables included in the analysis are presented in Tables 1 and 2, Figures 8-12 and Appendix I. As expected from the policy change and resulting lack of time between notification and deadline (when payments begin), the mean number of days between when the ready for discharge notifications were given and actual discharges took place ('delayed discharge days') in 2012 (.31) is far less than the 2011 mean (4.83) (See page 24, Figure 6 for graphical timeline reference). Also as expected, the mean number of days between the discharge deadline and actual discharge ('days from deadline') from 2011 (-.78) is negative and by far less than that of 2012 (.23) but this can be explained by the fact that negatives values existed in 2011 and were theoretically impossible in 2012. This was due to a large 7 day window in 2011 for a discharge to be made within Oslo, making it possible for the value of this variable to be less than zero. Yet, when taking this into account by looking at only those discharges who exceeded the discharge deadline ('payment days'), the mean number of days in 2011 (3.15) was greater than that in 2012 (2.52). All of these differences proved to be statistically significant at the .05 level when a t-test was performed (See Table 2). In Table 1, we also see a sharp increase in the number of cases from 2011 to 2012 in the first two measures, with delayed discharge days having nearly doubled in number of patient discharges and days from deadline having more than doubled. As previously mentioned, all sample sizes are relatively large, such that I am able to assume normality even though the skewness and kurtosis values for all variables are quite large and positive (See Appendix I). Table 2 shows the results from independent-samples t-tests that were conducted to compare the difference in the mean number of delayed discharge days, days from deadline and payment days between 2011 and 2012.

Table 2. T-test results for overall dependent variables

Variable		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Delayed Discharge Days	Equal variances assumed	4402.193	.000	98.507	16269	.000	4.518
	Equal variances not assumed			75.965	6205.817	.000	4.518
Days From Deadline	Equal variances assumed	4585.794	.000	-25.779	14842	.000	-1.010
	Equal variances not assumed			-18.442	4791.997	.000	-1.010
Payment Days	Equal variances assumed	24.028	.000	4.922	2340	.000	.630
	Equal variances not assumed			4.956	2272.536	.000	.630

There was a significant difference in the number of delayed discharge days between 2011 (M=4.83, SD=4.39) and 2012 (M=.31, SD=1.259); t(6205.82)= 75.97, p<.001. There was also a significant difference in the number of days from deadline between 2011 (M=-0.78, SD=3.52) and 2012 (M=.23, SD=1.246); t(4792)= -18.44, p<.001. Likewise, the difference in payment days was significant between 2011 (M=3.15, SD=3.42) and 2012 (M=2.25, SD=2.71); t(2272.54)= 4.96, p<.001. These results suggest that there was a significant change in the periods of time that are of interest including when accounting for only those who exceeded the deadline.

To further investigate the impact of the differences between years (before and after reform implementation) for delayed discharge days, days from deadline and payment days, a series of two-tailed independent t-tests were conducted on the data stratified by measures of city district, hospital, where patients were discharged to, age and gender. Initial examination of the data indicated that there were no significant violations of the assumptions of the t-test for any of the dependent variables.

5.1.1 Independent variables

The data shows varied differences among gender, age groups, hospitals, city districts and locations to which patients were discharged for the two years. The relative percentages for the variables and total counts relating to their respective year can be seen in Figures 8-12. The two years are displayed side-by-side so the change in percentage can be seen from year to year. The means for delayed discharge days, days from deadline and payment days for each variable can also be seen in Tables 3-7. One can speculate that these differences, between years among the different variables, are due to the implementation of the reform, finances spent on applicable nursing care, proportion of immigrants in the population or other unforeseen determinants affecting the use of services by each variable.

Gender

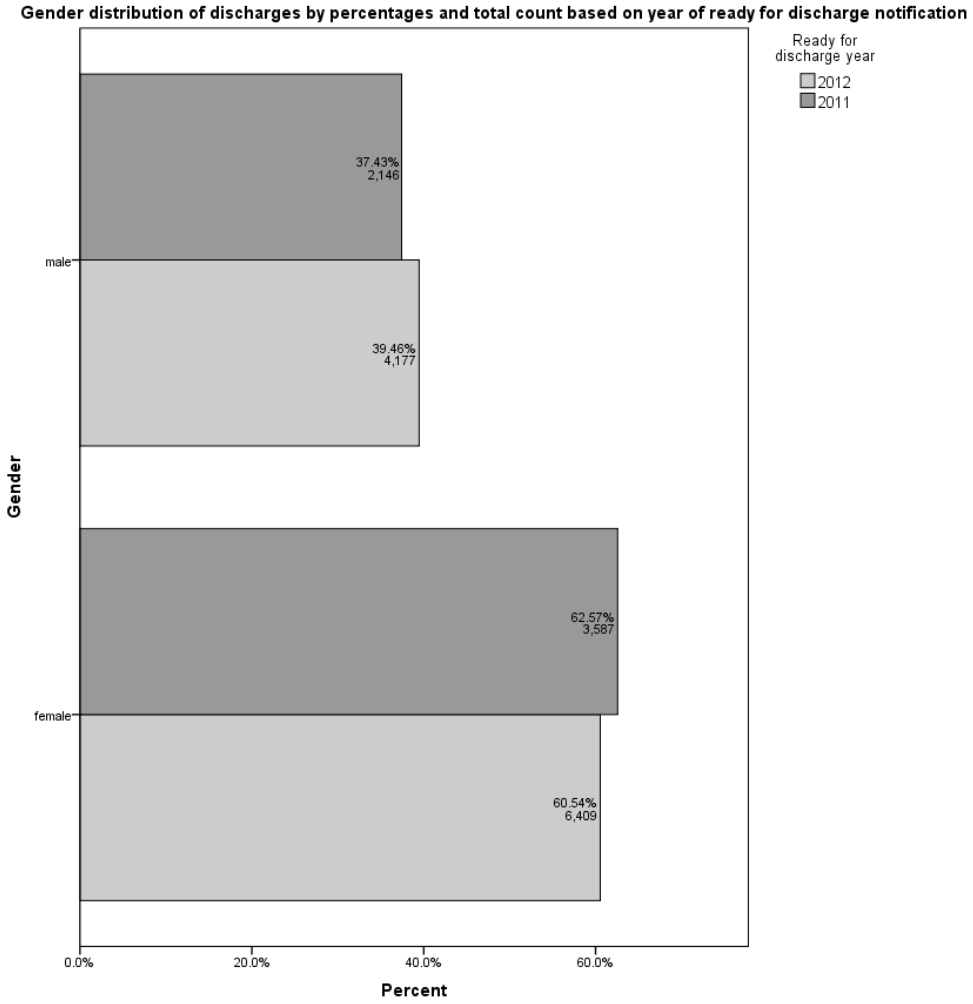

Figure 8. Gender distribution by percentage and total count based on year of ready for discharge notification

Women are more heavily represented in the dataset, and distribution of gender between the two years was pretty consistent with 62.6% women in 2011 and 60.5% women in 2012 as seen in Figure 8.

Table 3. Mean days by gender for dependent variables

Gender	Ready for discharge year	Delayed Discharge Days	Days From Deadline	Payment Days
Male	2011	4.81	-.71	3.34
	2012	.31	.23	2.72
Female	2011	4.85	-.81	3.05
	2012	.32	.24	2.41

Age Groups

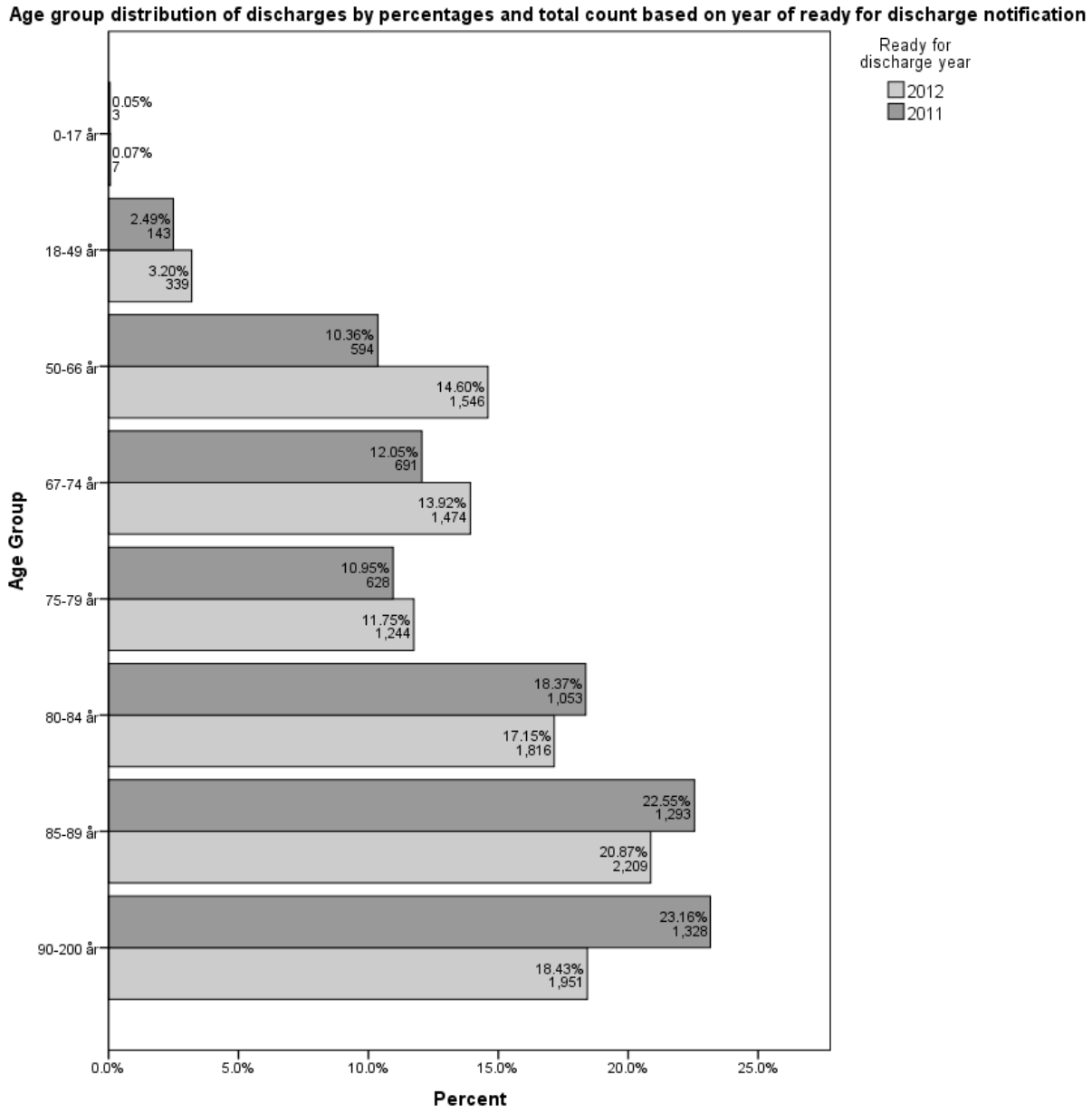

Figure 9. Age group distribution of discharges by percentages and total count based on year of ready for discharge notification

Based on Figure 9, we see that between the years, based on percentage, there was a shift between the age groups below 79 years and those above 80. For those in age groups below 79 years there were a greater percentage of discharges in 2012 relating to the overall total. The opposite was true for those above 80 years, those groups had a higher percentages relating to the overall discharges in 2011 than 2012. It can also be seen that in 2011 over 60% (64.08) of the patients discharges needing municipal services after discharge were 80 years old or above. 2012 was similar with over 55% (56.45) 80 years or older.

Table 4. Mean days by age group for dependent variables

Age Group	Ready for discharge year	Delayed Discharge Days	Days From Deadline	Payment Days
0-17 år	2011	2.67	.	.
	2012	6.14	6.14	43.00
18-49 år	2011	4.13	-.05	3.75
	2012	.14	.05	2.82
50-66 år	2011	4.29	-.86	3.58
	2012	.15	.11	2.61
67-74 år	2011	4.75	-.71	3.88
	2012	.20	.14	2.27
75-79 år	2011	4.61	-.75	3.14
	2012	.29	.23	2.53
80-84 år	2011	4.84	-.89	3.01
	2012	.34	.24	2.23
85-89 år	2011	4.89	-.85	2.80
	2012	.41	.31	2.60
90-200 år	2011	5.24	-.68	3.11
	2012	.43	.34	2.59

a. t cannot be computed because at least one of the groups is empty.

The mean number of days for each age group corresponding to the three measures is found above in Table 4. When comparing the groups, 0-17 years was disregarded due to such a low number of cases. We see that the mean number of delayed discharge days for 2011 and 2012 increases with age from 18-49 years to 90-200 years. This is also true for days from deadline when looking at 2012, but is more complicated due to negative values in 2011. Based on the numbers, in 2011 the greatest mean was -0.05 days (18-49 years) and the lowest -0.89 days (80-84 years). If there was a patient the municipality had to pay for, the greatest mean was 3.88 days (67-74 years) in 2011 and 2.82 days (18-49 years) in 2012. The lowest means were 2.8 days (85-89 years) in 2011 and 2.23 days (80-84 years) in 2012.

Independent-samples t-tests were conducted to compare these means between 2011 and 2012, stratified by age groups. The complete t-test results are found in Appendix I. There was a significant difference ($p<.05$) in the extent of delayed discharge in all age groups between 2011 and 2012. There was also a significant difference ($p<.05$) in the extent of days from deadline for all age groups between 2011 and 2012 except for 0-17 years and 18-49 years. Additionally, when accounting for those whose discharges exceeded the deadline (payment days) the only age groups with a significant difference ($p<.05$) between 2011 and 2012 were 67-74 years, 80-84 years and 90-200 years. All other age groups did not have a significant difference regarding this measure. These results suggest that there was a significant change in these periods of time which are of interest for all age groups of patient discharges except for those groups identified as not having a significant difference.

Hospitals

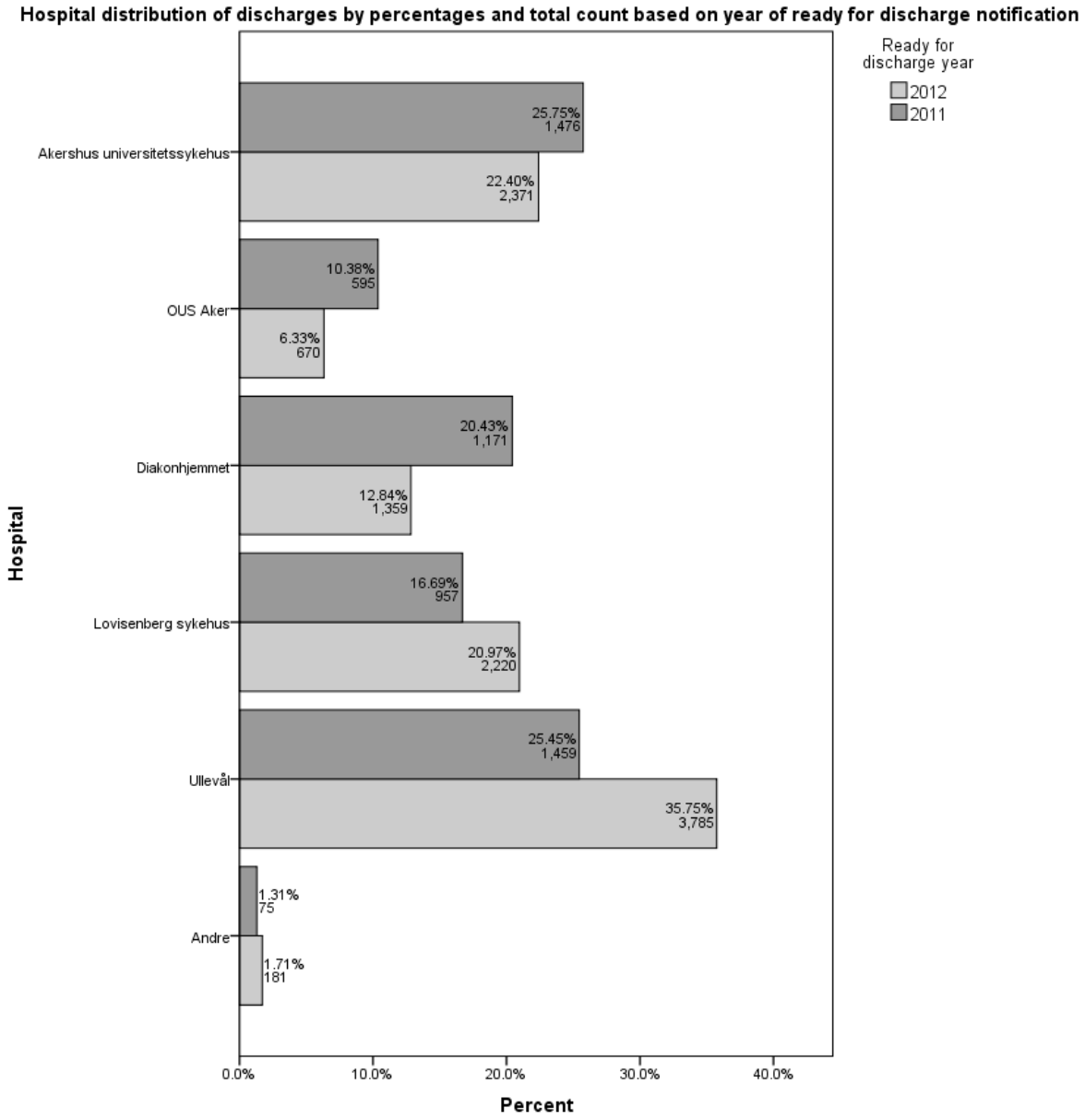

Figure 10. Hospital distribution of discharges by percentages and total count based on year of ready for discharge notification

Looking at Figure 10, we see the greatest percentage of discharges requiring municipal services in 2011 were from Akershus universitetssykehus, with Ullevål a close second. In 2012, Ullevål had by far the greatest percentage of discharges requiring municipal services, over ten percent higher than Akershus universitetssykehus who had the next highest percentage. Between the two years from 2011 to 2012, Akershus universitetssykehus, OUS Aker and Diakonhjemmet had a decrease in their percentage of the overall discharges requiring municipal services, whereas Lovisenberg sykehus and Ullevål experienced an increase.

Table 5. Mean days by hospital for dependent variables

Hospital	Ready for discharge year	Delayed Discharge Days	Days From Deadline	Payment Days
Akershus universitetssykehus	2011	3.23	2.20	4.32
	2012	.18	.14	2.13
OUS Aker	2011	5.90	-.43	2.90
	2012	.36	.14	2.34
Diakonhjemmet	2011	5.38	-.96	3.64
	2012	.80	.78	2.62
Lovisenberg sykehus	2011	5.12	-.91	2.31
	2012	.08	.06	1.87
Ullevål	2011	5.43	-1.18	2.75
	2012	.35	.22	2.76
Andre	2011	4.20	-.34	5.40
	2012	.27	.13	3.08

The mean number of days for each hospital corresponding to the three measures is found above in Table 5. We see that the mean number of delayed discharge days in 2011 was greatest for OUS Aker and for Diakonhjemmet in 2012. Akershus universitetssykehus had the shortest mean delayed discharge days in 2011, whereas Lovisenberg sykehus had the shortest in 2012. Interestingly, even though Akershus universitetssykehus had the shortest mean delayed discharge days in 2011, it was the only hospital with a positive mean for days from deadline in the same year. The lowest mean for days from deadline in 2011 was from Ullevål which was below -1. In 2012, Diakonhjemmet had the greatest mean for days from deadline and Lovisenberg sykehus the lowest. When the municipality had to pay for a patient, the greatest mean was 4.32 days (Akershus universitetssykehus) in 2011 and 2.76 days (Ullevål) in 2012. This is disregarding "Andre" (Other), since it cannot be attributed to a specific hospital, which was the greatest for both years. Lovisenberg sykehus had the lowest mean payment days for both years with 2.31 days in 2011 and 1.87 days in 2012.

Independent-samples t-tests were conducted to compare these means between 2011 and 2012, stratified by hospital. The complete t-test results are found in Appendix I. There was a significant difference ($p<.05$) in delayed discharge for patients from all hospitals between 2011 and 2012. There was also a significant difference in days from deadline for all hospitals except those bundled at "Andre" (other) for 2011 and 2012. Akershus universitetssykehus, Diakonhjemmet and Lovisenberg sykehus all had significant differences ($p<.05$) in the number of days for those patients who exceeded their discharge deadline date (payment days) between 2011 and 2012. The remaining hospitals did not display a significant difference pertaining to this measure. These results suggest that there was a significant change at the individual hospital level for delayed discharge days, days from deadline and payment days except for those differences between hospitals that were identified as not having a significant difference.

City Districts

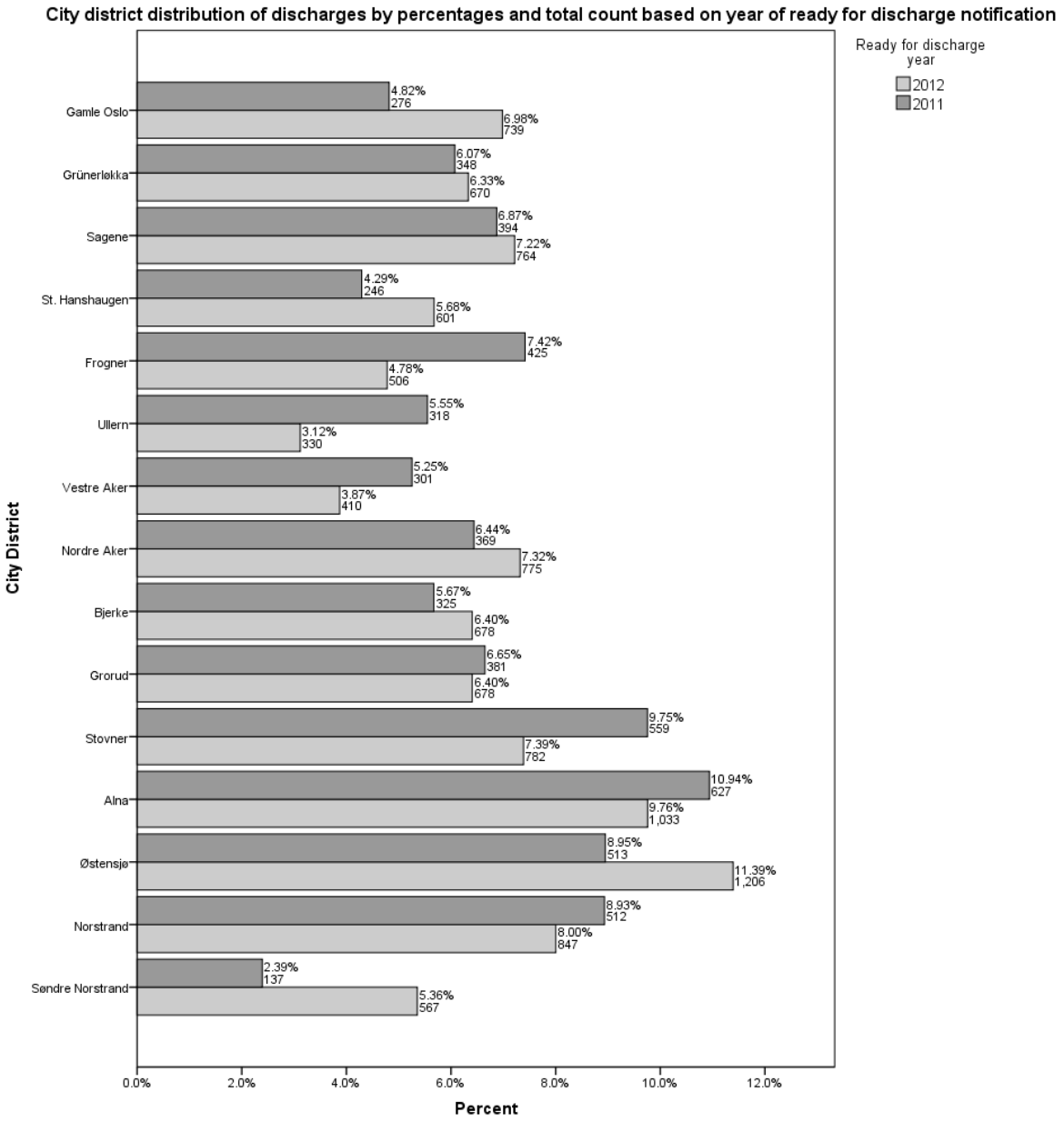

Figure 11. City district distribution of discharges by percentages and total count based on year of ready for discharge notification

In Figure 11, we see that the city district, with the greatest percentage of discharges requiring municipal services in 2011, was Alna. In 2012, Østensjø had the greatest percentage of discharges requiring municipal services. Overall, we can see wide variation in the changes between the two years among the city districts relating to the percentage of discharges requiring municipal services.

Table 6. Mean days by city district for dependent variables

City District	Ready for discharge year	Delayed Discharge Days	Days From Deadline	Payment Days
Gamle Oslo	2011	5.63	-.40	2.40
	2012	.11	.07	2.38
Grünerløkka	2011	4.75	-1.20	2.25
	2012	.11	.07	2.00
Sagene	2011	4.74	-1.36	2.96
	2012	.05	.02	2.00
St. Hanshaugen	2011	6.11	.13	2.68
	2012	.15	.13	1.63
Frogner	2011	5.31	-.73	3.40
	2012	.80	.79	2.52
Ullern	2011	5.68	-.33	3.52
	2012	.25	.22	1.43
Vestre Aker	2011	5.17	-1.93	4.56
	2012	1.41	1.41	3.11
Nordre Aker	2011	5.00	-1.44	2.03
	2012	.12	.08	2.76
Bjerke	2011	5.56	-.41	1.75
	2012	.28	-.02	1.24
Grorud	2011	3.34	2.59	4.24
	2012	.12	.08	3.88
Stovner	2011	2.53	5.00	13.00
	2012	.29	.27	2.26
Alna	2011	3.88	-1.11	2.43
	2012	.18	.13	2.06
Østensjø	2011	6.38	-.61	2.94
	2012	.85	.66	3.08
Norstrand	2011	5.33	-1.68	3.50
	2012	.20	.01	1.85
Søndre Norstrand	2011	5.27	-.88	3.42
	2012	.04	-.04	1.29

The mean number of days for each city district for each of the three measures studied is found above in Table 6. The mean number of delayed discharge days was greatest for Østensjø in 2011 and Vestre Aker in 2012. Stovner had the shortest mean delayed discharge days in 2011, whereas Søndre Norstrand had the shortest in 2012. Interestingly, in addition to the lowest mean for delayed discharge days in 2011, Stovner had the greatest mean for days from discharge in that year. Vestre Aker had the lowest mean for days from deadline in 2011 but the greatest in 2012. Søndre Norstrand had the lowest mean for days from deadline in 2012. In cases when the municipality had to pay for an exceeded deadline, the greatest mean was 13.0 days (Stovner) in 2011 and 3.88 days (Grorud) in 2012. Bjerke had the lowest mean payment days for both years with 1.75 days in 2011 and 1.24 days in 2012.

Independent-samples t-tests were conducted to compare these means between 2011 and 2012, stratified by city district. The complete t-test results are found in Appendix I. There was a significant difference ($p<.05$) in delayed discharge days in all districts between 2011 and 2012. There was also a significant difference ($p<.05$) in days from deadline for all districts except St. Hanshaugen and Stovner for 2011 and 2012. St. Hanshaugen, Ullern, Norstrand and Søndre Norstrand all had significant differences ($p<.05$) in the number of days when

accounting for those discharges which exceeded their deadlines (payment days) between 2011 and 2012. All other districts did not display a significant difference pertaining to this measure. These results suggest that there was a significant change at the individual city district level for delayed discharge days, days from deadline and payment days except for those districts identified as not having significant differences.

Discharged to location

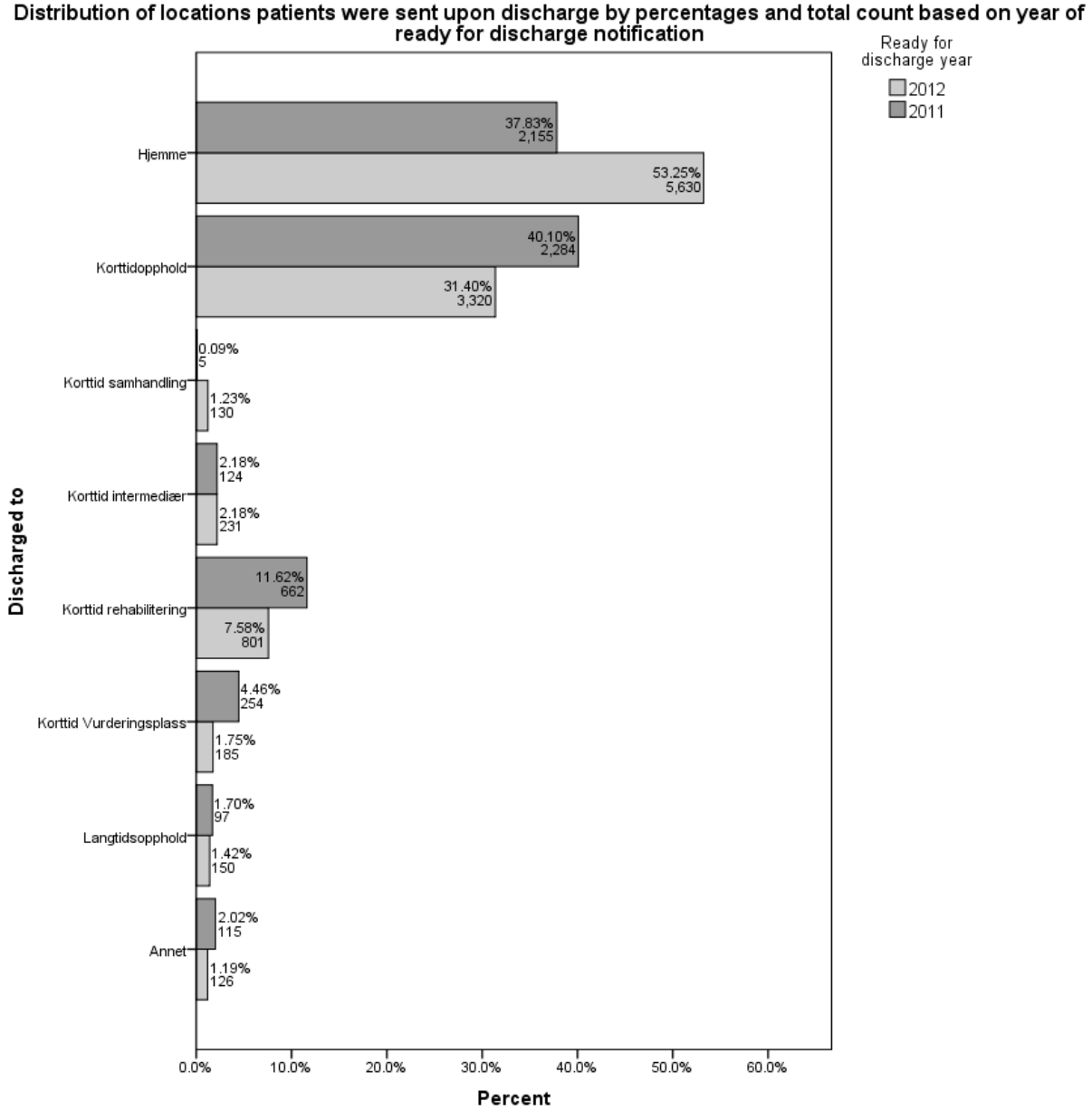

Figure 12. Distribution of locations patients were sent upon discharge by percentages and total count based on year of ready for discharge notification

Figure 12 shows the location that patients were sent to upon discharge, the most common based on percentage, was korttidopphold (short-term stay) in 2011 and hjemme (home) in 2012. Based on over all percentages, there was a 15% increase in patients being sent home for care between 2011 and 2012.

Table 7. Mean days by location sent upon discharge for dependent variables

Discharged to	Ready for discharge year	Delayed Discharge Days	Days From Deadline	Payment Days
Hjemme	2011	3.26	-1.75	2.93
	2012	.11	.05	2.67
Korttidopphold	2011	5.81	-.36	3.05
	2012	.59	.47	2.59
Korttid samhandling	2011	4.80	-1.20	3.00
	2012	.25	.21	2.08
Korttid intermediær	2011	4.48	-.58	3.81
	2012	.26	.13	2.07
Korttid rehabilitering	2011	5.76	-.39	3.30
	2012	.49	.41	2.36
Korttid Vurderingsplass	2011	6.07	-.42	3.08
	2012	.64	.58	2.00
Langtidsopphold	2011	8.08	1.13	5.14
	2012	.59	.44	2.68
Annet	2011	4.61	-.75	3.46
	2012	.49	.46	2.48

Table 7 shows the mean number of days for the three periods based on the location to which patients were sent upon discharge. The mean number of delayed discharge days and days from deadline was greatest for those sent to langtidsopphold (long-term stay) in 2011 and to korttid vurderingsplass (short-term evaluation place) in 2012. Patients discharged home to receive care had the shortest mean delayed discharge days and days from deadline in 2011 and 2012. If the discharge deadline was exceeded and a patient had to be paid for by the municipality, the greatest mean was for patients sent to langtidsopphold with 5.14 days in 2011 and 2.68 days in 2012. Those discharged to home care (hjemme) had the lowest mean payment days in 2011 and korttid vurderingsplass in 2012.

Independent-samples t-tests were conducted to compare these means between 2011 and 2012, stratified by location to which patients were sent upon discharge. The complete t-test results are found in Appendix I. There was a significant difference ($p<.05$) in delayed discharge days for all locations patients were sent upon being discharged between 2011 and 2012. There was also a significant difference in days from deadline for all locations patients were sent upon being discharged in 2011 and 2012 except for korttid samhandling, korttid intermediær and langtidsopphold. Additionally, regarding payment days, those sent to korttidopphold, korttid rehabilitering, korttid vurderingsplass and langtidsopphold locations showed a significant difference ($p<.05$) between 2011 and 2012. The other location types did not have a significant difference between the two years. These results suggest that there was a significant change in delayed discharge days, days from deadline and payment days for all locations patients were sent upon being discharged except for those location types that have been identified as not having a significant difference.

5.1.2 Supply and demand variables

Table 8. Supply and demand characteristics of city districts in 2011 and 2012

City District	Year	Population	Spending on Nursing Care in 1000 NOK	% Population over 80 years	% Immigrant population
Gamle Oslo	2011	43770	330,931	1.76	24.9
	2012	44958		1.67	24.9
Grünerløkka	2011	47256	431,426	2.26	17.8
	2012	49307		2.03	17.7
Sagene	2011	35115	405,079	2.57	14.4
	2012	35990		2.38	14.4
St. Hanshaugen	2011	33137	285,988	2.62	10.3
	2012	34109		2.45	10
Frogner	2011	51120	611,656	4.07	7.2
	2012	52531		3.96	7.7
Ullern	2011	30744	416,195	5.41	5.9
	2012	31275		5.15	5.8
Vestre Aker	2011	44320	611,422	4.74	5.6
	2012	45186		4.67	5.8
Nordre Aker	2011	47433	590,673	4.33	7.4
	2012	48432		4.19	7.7
Bjerke	2011	28226	414,348	4.58	29.2
	2012	29090		4.30	29.4
Grorud	2011	26291	410,067	4.19	34.1
	2012	26777		4.09	34.8
Stovner	2011	30178	379,628	2.90	40
	2012	30554		2.98	41.1
Alna	2011	47025	728,473	3.74	36.6
	2012	47786		3.70	37.4
Østensjø	2011	46244	739,650	6.36	13.8
	2012	47164		6.22	14.1
Norstrand	2011	46888	684,861	5.91	6.6
	2012	47696		5.79	6.8
Søndre Norstrand	2011	35843	327,456	1.63	38.4
	2012	36304		1.63	39

Table 8 provides the percentages used for population over 80 years and immigrants in the city districts of Oslo. The values used in calculating per person spending on nursing care (population and spending) are also displayed. Again, since the spending numbers for 2012 are not yet available, yet unlikely to significantly change from 2011, the 2011 figures were used with the 2012 population numbers to calculate the per person spending.

5.2 Multivariate Least Squares Regressions

The main objective to performing the multiple linear regressions was to investigate variation in the specific time periods between when the ready for discharge notification was given and the actual discharge took place. In every model, over 5,000 patient discharges were included in the time period between 2011 and 2012, covering all patients requiring municipal services after they were discharged within the municipality of Oslo, except for those concerning payment days which had over 1,000 (see Appendix I). This study's primary emphasis is geographic and demographic variations related to the time between when a patient is deemed ready for discharge and their actual discharge, with a secondary focus on days from the discharge deadline and actual discharge, as well as, if payment had to be made by the

municipality. The analyses are based on the possible variation between age, gender, hospitals, city districts, and what type of facility to which patients are sent upon being discharged.

All analyses were performed according to the multiple regression model described in a previous chapter (See section 4.3). Multiple models are included in the results, all different variations to explain the time periods delayed discharge days, days from deadline and payment days. The regressions were performed accounting for 2011 and 2012 individually and then a single model equation accounting for difference in year within the equation.

To evaluate the hypotheses previously made, estimates of the intercept and the independent variables are described below.

When accounting for year the discharge notification took place, Ullevål sykehus had the largest percentage of discharges and was closest to the overall mean for both days of delayed discharge and days from deadline for 2012. The city district of Østensjø had the highest overall percentage of discharges for 2011 and 2012 combined. Home (Hjemme) was far and away the greatest location which patients were discharged to in 2012, by percentage, with 53.2% and close second in 2011. Based on these findings, the regression analyses were conducted using those three reference category variables (Ullevål sykehus, Østensjø and Hjemme) by excluding their dummy variables from the equations. Males and age group 18-49 years were also used as reference categories for all models. In even numbered models, year was included in the model equation with 2011 as the reference variable. The basic model equations were estimated using multiple linear regression analysis, and the results are reported in Table 9 and Appendix II. Comments about the regression estimates are given and then further explained in the discussion chapter.

5.2.1 Delayed discharge days

Multiple linear regressions were carried out to ascertain the extent to which age, gender, city district, hospital, and type of services discharged to predict the number of delayed discharge days (days between a discharge ready notification and actual discharge). Model I looks at 2011 and 2012 independently and Model II has the years combined. In models III-VI additional supply, demand, and population variables were added and analyzed both for 2011 and 2012 independently, and then combined as in Models I and II.

Table 9. Regression models for Delayed discharge days

Variable	Estimate β								
	Model I		Model II	Model III		Model IV	Model V		Model VI
	2011	2012		2011	2012		2011	2012	
(Constant)	4.879****	.740****	5.091****	4.105****	-.353***	4.044****	5.955****	-.007	5.104****
Female	-.127	-.036	-.044	-.101	-.029	-.036	-.104	-.026	-.041
Discharge Ready 2012			-4.346****	-	-	-4.320****	-	-	-4.344****
0-17 år	.127	6.116****	4.195****	-.166	5.980****	4.091****	-.396	5.957****	4.025****
50-66 år	-.249	-.059	-.148	-.308	-.080	-.178	-.281	-.100	-.171
67-74 år	-.120	-.089	-.105	-.193	-.091	-.138	-.184	-.103	-.139
75-79 år	-.450	-.084	-.229	-.490	-.090	-.260*	-.445	-.086	-.241*
80-84 år	-.505	-.101	-.266**	-.554	-.091	-.286**	-.513	-.090	-.261*
85-89 år	-.539	-.022	-.243*	-.581	-.046	-.284**	-.519	-.042	-.257*
90-200 år	-.446	-.032	-.197	-.508	-.043	-.228*	-.429	-.032	-.188
Gamle Oslo	.140	-.607****	-.441****	-	-	-	-	-	-
Grünerløkka	-1.167****	-.654****	-.831****	-	-	-	-	-	-
Sagene	-1.138****	-.731****	-.905****	-	-	-	-	-	-
St. Hanshaugen	.391	-.594****	-.328**	-	-	-	-	-	-
Frogner	-.647*	-.154*	-.404**	-	-	-	-	-	-
Ullern	-.169	-.714****	-.508***	-	-	-	-	-	-
Vestre Aker	-.930**	.478****	-.125	-	-	-	-	-	-
Nordre Aker	-1.457****	-.764****	-.968****	-	-	-	-	-	-
Bjerke	-.833***	-.605****	-.692****	-	-	-	-	-	-
Grorud	-1.662****	-.511****	-.986****	-	-	-	-	-	-
Stovner	-2.090****	-.264**	-1.131****	-	-	-	-	-	-
Alna	-1.126**	-.447****	-.752****	-	-	-	-	-	-
Norstrand	-1.103****	-.718****	-.813****	-	-	-	-	-	-
Søndre Norstrand	-.778*	-.765****	-.791****	-	-	-	-	-	-
Akershus universitetssykehus	-.486[1]	-.241[1]**	-.351[1]**	-.978****	-.135***	-.571****	-	-	-
OUS Aker	.461**	.017	.346****	.544***	.032	.362****	-	-	-
Diakonhjemmet	.249	.054	.139	.540***	.492****	.450****	-	-	-
Lovisenberg sykehus	-.033	-.092*	-.059	.524**	.070*	.242***	-	-	-
Andre	.019	-.067	-.134	-.495	.007	-.154	-	-	-
Korttidopphold	2.321****	.452****	1.111****	2.278****	.411****	1.077****	2.343****	.422****	1.092****
Korttid samhandling	.111	.257**	.173	1.102	.288***	.400*	.826	.246**	.311
Korttid intermediær	1.476****	.068	.492****	1.327****	.086	.465***	1.239****	.081	.430***
Korttid rehabilitering	2.064****	.329****	.985****	2.086****	.328****	1.011****	2.160****	.354****	1.020****
Korttid Vurderingsplass	2.130****	.337****	1.195****	2.294****	.358****	1.235****	2.462****	.452****	1.314****
Langtidsopphold	4.537****	.484****	2.056****	4.483****	.459****	2.034****	4.572****	.475****	2.036****
Annet	1.182****	.334***	.574****	1.220***	.327***	.575****	1.331****	.345***	.591****
Percentage from Africa, Asia, Turkey and South and Central America	-	-	-	.023**	.010****	.016****	-	-	-
percent_pop_over_80	-	-	-	.502[1]****	.183[1]****	.341[1]****	.656****	.158****	.402****
combined spending on nursing care by 1000 NOK	-	-	-	-.201***	-.030[1]**	-.102[1]****	-.362****	-.030****	-.179****
Adjusted R Square	.118	.114	.418	.107	.078	.414	.102	.065	.411
Durbin Watson	1.822	1.731	1.723	1.821	1.643	1.723	1.793	1.624	1.700

**** = p≤0.001, *** = p≤0.01, ** = p≤0.05, * = p≤0.10
[1] = VIF > 10

Models I and II

Model I predicted 11.8% of the variation of delayed discharge days for 2011 and 11.4% of the variation for 2012. The model was suitable for predicting the outcome (F = 23.32 (2011) and 41.187 (2012), df = 34, p <.001).

In considering the constants, we notice the number of days between ready to be discharged notification and actual discharge was 4.879 days in 2011 and 0.740 days in 2012 depending

on the reference categories male, between the ages of 18 and 49 years, in Ullevål sykehus, from the district of Østensjø, and discharged home.

In this model no age group was a significant predictor in 2011 and only one in 2012 (0-17 years) with 6.116 ($p<0.001$). This indicates that the length of time between notification and actual discharge was longer by 6.116 days if a patient's age was below 18 years in 2012 but had no effect in 2011 when all other variables were constant.

The variable "Female" accounting for gender with male as the reference category has an estimate of -0.127 for 2011 and -0.036 for 2012 but both are not significant. This indicates that the length of time between notification and actual discharge was not affected by gender in 2011 or 2012 when all other variables were constant.

For 2011, the districts Grünerløkka ($p<.01$), Sagene ($p<.01$), Frogner ($p<.10$), Vestre Aker ($p<.05$), Nordre Aker ($p<.001$), Bjerke ($p<.01$), Grorud ($p<.01$), Stovner ($p<.001$), Alna ($p<.05$), Norstrand ($p<.001$) and Søndre Norstrand ($p<.10$) all had significantly negative correlations to the number of delayed discharge days. This indicates that they each had shorter amounts of delayed discharge than the reference district Østensjø if everything else is constant. All the other correlations for the remaining districts from 2011 were not significant. The district Vestre Aker ($p<.001$) had a significantly positive correlation in the number of days between notification and actual discharge in 2012 in comparison to the reference district Østensjø, whereas all of the other districts had significantly negative correlations. This is an indication that Vestre Aker, with a positive correlation, had delayed discharge periods longer than Østensjø and those negatively represented districts had shorter durations compared to the reference with everything else being constant.

The only hospital with significant correlation to the reference, Ullevål, for delayed discharge days in 2011 was OUS Aker ($p<.05$) with a positive correlation of 0.461 days. 2012 only had two significantly correlated hospital to the reference which were Akershus universitetssykehus ($p<.01$) and Lovisenberg ($p<.10$) with negative correlations of -0.241 and -0.092 days respectively. These relationships indicate that OUS Aker had a longer mean length of time in 2011 whereas Akershus universitetssykehus and Lovisenberg shorter in 2012 than Ullevål concerning the duration of delayed discharge days with everything else being constant.

When considering the locations to where patients were discharged in 2011, all locations except for Korttid samhandling (p=.953), had significantly positive correlations (Korttidopphold (p<.001), Korttid intermediær (p<.001), Korttid rehabilitering (p<.001), Korttid Vurderingsplass (p<.001), Langtidsopphold (p<.001), Annet (p<.01) compared to the reference Hjemme (Home) with everything else being constant. 2012 was similar with all locations, except Korttid intermediær (p=.396), having significantly positive correlations (Korttidopphold (p<.001), Korttid samhandling (p<.05), Korttid rehabilitering (p<.001), Korttid Vurderingsplass (p<.001), Langtidsopphold (p<.001), Annet (p<.01)) for delayed discharge days compared to the reference location Hjemme (Home) with everything else being constant. This means that time between notification and actual discharge for those patients going home or needing home care was significantly shorter than all other locations in both 2011 and 2012 with the exception of those two that were mentioned as being non-significant.

Model II analyzed the same information as model I but combined the data and included the year in the equation. This model predicted 41.8% of the variation in delayed discharge days and was suitable for predicting the outcome ($F = 335.214$, $df = 35$, $p < .001$).

According to the model constant, the extent of delayed discharge days was 5.091 days depending on the reference categories; notification year 2011, male, age between 18 and 49 years, in Ullevål sykehus, from the district of Østensjø, and discharged home.

The variable "Discharge Ready in 2012," accounting for the difference in year the discharge notification was given, was included and there is a significantly negative correlation between the year 2012 (p<.001) and the reference 2011 of -4.35 days. This means when everything else remains constant, there are 4.35 less days between discharge notification and actual discharge in 2012 than 2011 for those patients requiring municipal services.

In this model, only the age groups 0-17 years (p<.001), 80-84 years (p<.05) and 85-89 years (p<.10) had significant correlations with 4.195, -0.266 and -0.243 respectively. This indicates that the length of time between notification and actual discharge was longer by 4.195 days for those less than 17 years and shorter by 0.266 and 0.243 days for those between the ages of 80 and 84 and 85 and 89 compared to those between the ages of 18 and 49 when all other variables were constant. The age group 75-79 years was nearly significantly correlated with a significance value of p=.101.

The variable "Female," accounting for gender with male as the reference category, was not significant. This indicates that the length of time between notification and actual discharge was not affected by gender when all other variables were constant.

All districts had significantly negative correlations to the days between notification and actual discharge except for Vestre Aker, which was not significant. This indicates that they all had shorter extents of delayed discharge than the reference district Østensjø concerning days from notification of discharge ready to actual discharge when everything else is constant.

The only hospitals with significant correlations to the reference Ullevål for days between notification and actual discharge in were OUS Aker ($p<.001$) which was positive with 0.346 days and Akershus universitetssykehus ($p<.05$) with a negative correlation of -0.351 days. These relationships mean that OUS Aker had a longer period of time and Akershus universitetssykehus shorter than Ullevål's delayed discharge days with everything else being constant.

When considering the locations to where patients were discharged, all locations except for Korttid samhandling had significantly positive correlations (Korttidopphold ($p<.001$), Korttid intermediær ($p=.001$), Korttid rehabilitering ($p<.001$), Korttid Vurderingsplass ($p<.001$), Langtidsopphold ($p<.001$), Annet ($p=.001$)) compared with the reference Hjemme (home) with everything else being constant. This means that the extent of delayed discharge days for those patients going home or needing home care was significantly shorter than all other locations with all else being constant with the exception of Korttid samhandling.

Models III and IV

Models III and IV functioned much like model I and II in the sense that model III gives equations for 2011 and 2012 individually, and model IV accounts for year of discharge notification in the equation as an independent variable. Model III and IV go beyond the differences in payment scheme and definition and introduce the variables to characterize supply and demand at the district level. These supply and demand variables, represented by percentage of inhabitants over age 80 and spending on home and non-hospital institutional nursing care, are stratified by city district, and therefore act as proxies for districts, which have been omitted to avoid collinearity.

Model III predicted 10.7% of the variation of delayed discharge days for 2011 and 7.8% of the variation for 2012. The model was suitable for predicting the outcome (F = 30.694 (2011) and 39.729 (2012), df = 23, p <.001).

Based on the constants, the number of delayed discharge days was 4.105 in 2011 and -.353 days in 2012 depending on the reference categories male, between the ages of 18 and 49 years, in Ullevål sykehus, from the district of Østensjø, and discharged home.

In this model no age group was a significant predictor in 2011 and only one in 2012 (0-17 years) with 5.980 (p<0.001). This indicates that the length of time between notification and actual discharge was longer by 5.980 days if a patient's age was below 18 years in 2012 but had no effect in 2011 when all other variables were constant.

The variable "Female," accounting for gender with male as the reference category, has an estimate of -0.101 for 2011 and -0.029 for 2012 but both are not significant. This indicates that the length of time between notification and actual discharge was not affected by gender in 2011 or 2012 when all other variables were constant.

All hospitals had significant correlations in 2011 except for those grouped as Andre. Akershus universitetssykehus had a negative correlation of -0.978 (p<.001) whereas the other three were positively correlated with OUS Aker 0.544 (p<.01), Diakonhjemmet 0.540 (p<.01) and Lovisenberg sykehus 0.524 (p<.05). 2012 was similar with the exception of OUS Aker also not being significant with those grouped as Andre. Again, Akershus universitetssykehus had a negative correlation of -0.135 (p<.01) and Diakonhjemmet and Lovisenberg sykehus were positive with 0.492 (p<.001) and 0.070 (p<.10) days respectively. These relationships indicate Akershus universitetssykehus had shorter extents of delayed discharge than Ullevål in both 2011 and 2012, whereas the others that were significant had longer periods of delayed discharge with everything else being constant.

When considering the locations to which patients were discharged in 2011, all locations except for Korttid samhandling had significantly positive correlations (Korttidopphold (p<.001), Korttid intermediær (p<.001), Korttid rehabilitering (p<.001), Korttid Vurderingsplass (p<.001), Langtidsopphold (p<.001), Annet (p<.01) compared to the reference Hjemme (Home) with everything else being constant. 2012 was similar with all locations, except Korttid intermediær, having significantly positive correlations (Korttidopphold (p<.001), Korttid samhandling (p<.01), Korttid rehabilitering (p<.001),

Korttid Vurderingsplass (p<.001), Langtidsopphold (p<.001), Annet (p<.01)) for delayed discharge days compared to the reference location Hjemme (Home) with everything else constant. This means that time between notification and actual discharge for those patients going home or needing home care was significantly shorter than all other locations in both 2011 and 2012 with the exception of those two that were mentioned as being non-significant.

The supply and demand variables, including percentage of immigrants, were all significant for both years. Percentage of immigrants was positively significant with 0.023 (p<.05) in 2011 and 0.010 (p<.001) in 2012. The variable accounting for percentage of the population above 80 years old was significantly positive in both years, 0.502 (p<.001) in 2011 and 0.183 (p<.001) in 2012. The supply side variable for spending on nursing was significantly negative for both years with -0.201(p<.01) in 2011 and -0.030 (p<.05) in 2012. The variables for population over 80 and spending on nursing both had high collinearity with VIF values above 10. This was adjusted for in models V and VI.

Model IV analyzed the same information as model III but combined the data and included the year of discharge notification in the equation. This model predicted 41.4% of the variation in delayed discharge days and was suitable for predicting the outcome ($F = 480.546$, $df = 24$, $p<.001$).

According to the model constant, the extent of delayed discharge days was 4.044 days depending on the reference categories notification year 2011, male, age between 18 and 49 years, in Ullevål sykehus, from the district of Østensjø, and discharged home.

The variable "Discharge Ready in 2012," accounting for the difference in year the discharge notification was given, was included and there was a significantly negative correlation between the year 2012 (p<.001) and the reference 2011 of -4.32 days. This means when everything else remains constant, there are 4.32 less days between discharge notification and actual discharge in 2012 than 2011 for those patients requiring municipal services.

In this model the age groups 0-17 years (p<.001), 75-79 (p<.10), 80-84 years (p<.05) and 85-89 years (p<.05) and 90-200 years (p<.10) had significant correlations with -4.320, -0.260, -0.286, -0.284 and -0.228 respectively. This indicates that the length of time between notification and actual discharge was longer by 4.32 days for those less than 17 years and shorter by 0.260, 0.286, 0.284 and 0.288 days for those between the ages of 70 to 79, 80 to 84,

85 to 89 and 90 to 200 compared to those between the ages of 18 and 49 when all other variables were constant.

Just as in model III, the variable "Female" accounting for gender with male as the reference category was not significant. Therefore, delayed discharges were not affected by gender when all other variables were constant.

All hospitals had significant correlations in 2011 except for those grouped as Andre. Akershus universitetssykehus had a negative correlation of -0.571 ($p<.001$), whereas the other three were positively correlated with OUS Aker 0.362 ($p<.001$), Diakonhjemmet 0.450 ($p<.001$) and Lovisenberg sykehus 0.242 ($p<.01$). These relationships indicate Akershus universitetssykehus had shorter periods of delayed discharge than Ullevål, whereas the other three that were significant had longer periods of delayed discharge with everything else being constant.

When considering the locations to where patients were discharged, all locations, except for Korttid samhandling, had significantly positive correlations (Korttidopphold ($p<.001$), Korttid intermediær ($p<.01$), Korttid rehabilitering ($p<.001$), Korttid Vurderingsplass ($p<.001$), Langtidsopphold ($p<.001$), Annet ($p<.001$)) compared with the reference Hjemme (home) with everything else being constant. This means that the extent of delayed discharge days for those patients going home or needing home care was significantly shorter than all other locations with all else being constant, with the exception of Korttid samhandling.

The supply and demand variables, including percentage of immigrants were all significant in this model. Percentage of immigrants was positively significant 0.016 ($p<.0010$). The variable accounting for percentage of the population above 80 years old was significantly positive with 0.341 ($p<.001$). The supply side variable for spending on nursing was significantly negative with -0.102 ($p<.001$). The variables for population over 80 and spending on nursing both had high collinearity with VIF values above 10. This was adjusted for in models V and VI.

Models V and VI

Models V and VI functioned just the same as models III and IV but variables were removed to adjust for collinearity. Hospitals and immigrant population variables were removed in order to make the adjustment and retain the supply and demand variables. There were minor changes in the variable's correlation significance. The only changes in significance that occurred for 2011 were; Annet discharge location went from $p<.01$to $p<.001$ and nursing spending went

from p<.01 to p<.001. For 2012, korttid samhandling went from p<.01 to p<.05 and nursing spending went from p<.05 to p<.001. For the overall combined model, age groups 80-84 and 85-89 changed from p<.05 to p<.10, age group 90-200 went from p<.10 to being non-significant, and korttid samhandling went from p<.10 to being non-significant. There were also minor changes in the β coefficients. The complete results are found in Table 9.

5.2.2 Days From Deadline and Payment Days

Multiple linear regressions were also performed to ascertain the extent to which the same independent variables used for delayed discharge days predict the number of days from deadline (days between a discharge deadline and actual discharge). The same was done for payments days to determine how those same independent variables affected the number of days the municipalities had to pay for, in the event payment was required. In each model, the same independent variables used in Models I-VI were included, the results can be found in Appendix II. There is less focus on these results due to the complexity in comparability and analysis due to the changes in payment requirements and definitions of time periods between the two years. Therefore, the results will be briefly described in the discussion chapter secondary to the delayed discharge days' results.

6. DISCUSSION

6.1 Study objective

This study aimed to examine the effects on municipal and hospital behavior and decision making one year after implementation of the policies suggested in the Coordination Reform white paper. Changes in delayed discharges for patients who required municipal services upon being discharged were of primary focus. Data from before and after reform implementation was used, with special emphasis given to the municipality of Oslo. I first evaluated if there was significant difference between 2011 and 2012 (one year before reform implementation and one year after) in the periods of time from discharge ready notification to actual discharge. Based on those, or lack of, significant differences, I looked at what could explain or predict the variation in those periods. Characteristics describing the patients, the hospitals and the city districts were used to find probable explanations for the observations made by looking at various differences among the city districts of Oslo.

These different explanations, for the observed variations between different periods of time related to a patient's discharge date, were statistically tested using multiple independent predictor variables.

The increase in the relative costs, for the municipality to provide hospital care for patients ready for discharge, was anticipated to result in a decrease in the extent of delayed discharge. I also expected a greater extent of delays for those districts with higher percentages of population over 80 years of age and a lesser extent for those with more per person spending on nursing care.

6.2 Main findings

Based on the results of the t-tests, there was a significant difference of 4.518 in the mean number of delayed discharge days between 2011 and 2012, meaning that, on average, the overall delayed discharges were reduced by 4.518 days. The secondary measures for means, days from deadline and payment days, also had significant differences of -1.01 and 0.63 days respectively. The days from deadline had an increase of 1.01 days (going from negative to positive) between the two years, but are difficult to interpret due to the change in payment scheme and what defined the discharge deadline. On the other hand, when accounting for only those discharges that elicited payments, if a delayed patient had to be paid for, those payment

days were 0.63 days less on average in 2012 than in 2011. To explain these differences, most specifically the difference for delayed discharge days, we look to the results from the regression models. It is also very interesting to note, that for reasons unknown without speculating, the number of patients that were reported as requiring municipal services nearly doubled between 2011 and 2012.

The combined regression models that included the year in the model equation had the greatest explanatory power, explaining over 40% of the variance in the mean delayed discharge days. These combined regression model results were consistent with the t-test results with the difference in delayed discharge days having over a 4 day decrease in 2012. In general, age and gender of patients who were discharged did not have a significant effect on the extent of delayed discharge. In those few instances where an age group (those above 75 years) was mildly significant, they were negatively correlated around -0.2 days. This potentially suggests that either the hospitals were better at assessing the needs and predicting a date of discharge for those patients who were older than 75 years or the municipality was better able to accept those same patients, compared to those who were younger. This could be plausible since over half of those discharged to municipal services were 80 years old or above in both years, yet there is a certain degree of likelihood that this observation is affected by unrealized confounders.

With the exceptions of korttid samhandling and korttid intermediær, the locations to which patients were sent to upon being discharged were consistently, significantly correlated with positive effects in relation to the reference group hjemme. Langtidsopphold consistently had the greatest positive effect, but those patients make up such a small proportion of those being discharged. It is noteworthy, that those sent to general short term care facilities, which accounted for between 30 and 40% of the location types patients were discharged to in 2011 and 2012 (See Figure 12), often had the second highest effects. These results are an indication that those patients sent home experience the shortest delays in their discharges and those sent to long term care facilities experience the most extensive delays. Based on these findings, when deciding what type of services a patient should or will receive upon being discharged, and the existing efforts, aimed at allowing people to remain in their homes for as long as possible to receive care, should be continued. Based on the change in percentages of those discharged home compared to overall discharges, there is an indication that home care is increasing. As for general short- and long-term care, the results suggest that for those patients who cannot be sent home for continuation of care, expanding efforts that focus on increasing

the coordination in transfers to and availability of these locations would have a significant impact on reducing delays in discharges.

Once the city districts were replaced by the proxies that represented the population percentage over 80 years and spending on non-hospital institutional and home care nursing, the hospitals had significant effects in comparison to Ullevål, the reference hospital, with the exception of those grouped as Andre. These effects take into account controlling for age and gender. These results could be due to any number of factors including, but not limited to, treating different types of patients with different conditions/diagnoses, the culture of the hospital relating to eagerness to discharge patients and the type of hospital (local vs. university/research) (See 6.3 Limitations).

After the city districts were removed from the models and the supply and demand proxies added, the results were as follows: as the percentage of a district's population over the age of 80 increased, so did the delays in discharges, likewise, as a district's per person spending on nursing care increased, there was a decrease in the mean number of delayed discharge days. These differences were less pronounced in 2012 but so were the number of days allowed between discharge ready and discharge deadline. These results are in line with the hypothesis and indicate that perhaps the allocation of district funding for nursing should be improved or the elderly population proportion taken more into account, as there is currently no real correlation as seen in Table 8. The results suggest that if these measures are taken, waiting times for patients ready for discharge could be reduced further.

The findings from the regressions of secondary measures, days from deadline and payment days, were similar to those for delayed discharge days, with a few exceptions and the full results can be found in Appendix II. The biggest difference in the regression models for days from discharge was an interesting change in model XI data for 2011 once the hospitals were removed and the supply and demand characteristics were proxies for the city districts (See Appendix II). As the percentage of population over 80 increased, the days from deadline actually decreased and the opposite was true of spending on nursing care. It is important to note that the explanatory power of this model was only 5%, and more research is required to accurately interpret these results. Additionally, the age groups had a more significant effect for 2011 and in the combined models for days to deadline. The independent variables in the payment days regression models had sparsely significant effects and the explanatory power was reduced from the delayed discharge days models. One similarity to the days from

deadline results was the significantly positive effect of nursing spending seen in model XVII (See Appendix II). Again, I believe more research with additional data is needed to make accurate interpretations and conclusions about these results.

6.3 Limitations

Like any research or study, there are limitations to this study and the results should be understood with a degree of caution. Due to the reform being the only one of its kind with its exact characteristics, there is not much data and research to directly compare. The infancy of the policy implementation only allows me to look at the first year after, which can have certain characteristics simply due to the fact that it is a transitional period. This first year after is also only compared to the preceding year which limits the analytical scope.

When using register data, there are always concerns about the input reliability and accuracy, as well as overall quality of the data sets due to manual user inputs. At the same time, selection and recall bias are eliminated. There is also potential for confounding and other bias due to the explanatory nature of the study.

Even with the extensive measures taken to remedy errors and duplicate entries, there is still great potential for others to still exist. Standardization of the discharge information in Gerica has been mandated as a result of the Coordination Reform. This should alleviate some of the comparability problems related to different input and documentation methods that result from varied users responsible for the Gerica documentation process. The standardization is experiencing an on-going improvement process (Pedersen 2012).

The quazi-experimental nature of this study, partially uncontrolled before and after, makes it a bit less robust than optimal because of the potential uncertainty in accurately identifying the cause of the observed outcomes and results (Grimshaw et al. 2000, Eccles et al. 2003). Additionally, a post-one year evaluation for an intervention does not give the best data for making reliable, nor long-term, conclusions and the research should therefore be extended into the future for better long term trending analysis (Habicht, Victora, and Vaughan 1999).

Admission date data does not exist in the Gerica database and this is required to look at patients' entire lengths of stay, which would have been ideal for this analysis, giving it a much more complete picture. Gerica also does not have sufficient, useable documentation of the patient diagnosis and comorbidities which would allow me to make interpretations about differences seen among the hospitals.

6.4 Further Studies/Research

Based on the limitations and the novelty of this study, due to this reform's implementation infancy and being the only one with its exact characteristics, there will be opportunities for further studies and research as more and better quality data becomes available.

Additional research, that looks at additional years before implementation took place, could help give these results more validity by seeing if a trend in decreasing discharge delays already existed. The large increase in the number of patients being reported as requiring municipal services after the reform was implemented should also be explored further to find a likely cause or explanation.

Though admission date and diagnosis data does not exist in the Gerica database, it does in the Norwegian Patient Register (NPR), but unfortunately not at the individual city district level. Using admission date with the data in this study would provide the entire length of stay and give a comprehensive and more complete look at the results, enabling more descriptive results. The inclusion of diagnoses and comorbidities associated with discharged patients would enable better interpretations of variations observed among the hospitals. This could be done in the future as an extension of this study.

The fee paid for delayed discharge days (4000 NOK per day) could also be studied as an economic endpoint for measuring actual municipal expenses to the hospitals. A concern, beyond the scope of this paper, is that increases in premature hospital discharges have the potential to result in more re-admissions. These re-admission rates can also function as an indicator of municipal hospital expenses and behavior. Further research can help to understand this possibility and look at the rates of re-admissions to the hospitals. Additionally, depending on the results, in order to keep re-admissions from increasing and patients from being discharged too early, other financial deterrents that would penalize hospitals if patients are re-admitted within 30 days of discharge could be considered.

Looking at what happens to patients after being discharged to a municipal facility and the change in mortality percentages one week and one month post-discharge could also be considered in conjunction with a re-admission analysis relating to the data presented in this study. Transfers to different types of municipal facilities within one month of discharge could also be evaluated.

A study that included a qualitative portion characterizing the patient experiences could be useful. If greater proportions of patients, especially those who are elderly, are being sent to municipal care directly from the hospital, there may be an increase in these patients and their families being forced to make important life altering decisions from a hospital bed. This possibility could be studied and incorporated into a further assessment of the changes induced by the reform.

Lastly, the optimal extension of this research would be to link municipal and hospital registers to develop a complete and comprehensive database that could be used for comparisons and analysis. If this could be accomplished, this broad data matrix of linked data sets could be compared to other health systems, especially those which are most similar, for example the other Nordic nations. The overall effects of the coordination reform, including those analyzed in this study could be evaluated against other similar models.

7. CONCLUSION

To my knowledge, this is the first study investigating the effect that the changes resulting from the Coordination Reform have on municipal and hospital behavior and decision making, as well as, delayed discharges. The results in this study give an initial look into the changes that occurred in transition before and after reform implementation.

A significant difference between 2011 and 2012, seen as a decrease in the overall average delays in discharge, was observed. These differences are attributable to the type of municipal service location to which patients are being sent upon discharge, the supply of municipal services dictated by per person spending on nursing care and the demand for services with each district represented by the proportion of inhabitants over the age of 80 when controlling for age and gender.

This study can function to serve as a starting point for future research on the effects of not only the coordination reform, but other financial incentives used in other healthcare sectors and systems. This additional research should examine longer periods of time before and after implementation to evaluate trends and give a better overall characterization of the changes. Likewise, further studies should consider additional variables that can further explain the differences by incorporating more factors that will ultimately provide more detail. The possibility of linking data from the different system levels, specifically the municipalities and hospitals would add to the level of knowledge describing the effects of the coordination reform. Ultimately, studies evaluating reform implementation should incorporate and evaluate other similar health care systems and reforms to strengthen, as well as provide additional results.

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APPENDICIES

Appendix I - Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Delayed Discharge Days	16271	0	123	30864	1.90	3.526	6.194	.019	131.210	.038
Days From Deadline	14844	-14	60	-899	-.06	2.219	3.036	.020	57.885	.040
Payment Days	2342	1	60	6670	2.85	3.110	5.482	.051	66.966	.101

Descriptive Statistics

Ready for discharge year		N	Minimum	Maximum	Sum	Mean	Std. Deviation	Skewness		Kurtosis	
		Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
2011	Delayed Discharge Days	5698	0	123	27538	4.83	4.394	6.689	.032	133.571	.065
	Days From Deadline	4337	-14	60	-3363	-.78	3.516	2.201	.037	24.090	.074
	Payment Days	1206	1	60	3803	3.15	3.421	5.509	.070	68.354	.141
2012	Delayed Discharge Days	10573	0	43	3326	.31	1.259	9.292	.024	176.938	.048
	Days From Deadline	10507	-6	43	2464	.23	1.246	8.811	.024	184.663	.048
	Payment Days	1136	1	43	2867	2.52	2.705	5.148	.073	52.788	.145

Independent Variable Statistics

Independent Samples Test

Gender			Levene's Test for Equality of Variances		t-test for Equality of Means			
			F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Male	Delayed Discharge Days	Equal variances assumed	1215.663	.000	51.382	6299	.000	4.501
		Equal variances not assumed			38.485	2283.684	.000	4.501
	Days From Deadline	Equal variances assumed	1378.695	.000	-13.589	5709	.000	-.942
		Equal variances not assumed			-9.555	1736.665	.000	-.942
	Payment Days	Equal variances assumed	6.011	.014	2.356	858	.019	.620
		Equal variances not assumed			2.365	840.726	.018	.620
Female	Delayed Discharge Days	Equal variances assumed	3998.162	.000	89.395	9968	.000	4.529
		Equal variances not assumed			70.309	3942.386	.000	4.529
	Days From Deadline	Equal variances assumed	3431.623	.000	-22.365	9131	.000	-1.048
		Equal variances not assumed			-16.119	3035.555	.000	-1.048
	Payment Days	Equal variances assumed	23.955	.000	4.823	1480	.000	.639
		Equal variances not assumed			4.874	1403.717	.000	.639

Group Statistics

Age Group	Ready for discharge year	Delayed Discharge Days			Days From Deadline			Payment Days		
		N	Mean	Std. Deviation	N	Mean	Std. Deviation	N	Mean	Std. Deviation
0-17 år	2011	3	2.67	4.619	0[a]	.	.	0[a]	.	.
	2012	7	6.14	16.252	7	6.14	16.252	1	43.00	.
18-49 år	2011	142	4.13	5.115	84	-.05	4.024	28	3.75	4.265
	2012	339	.14	.958	335	.05	.626	11	2.82	1.662
50-66 år	2011	591	4.29	4.652	383	-.86	3.593	95	3.58	3.642
	2012	1546	.15	.934	1528	.11	.980	80	2.61	3.168
67-74 år	2011	685	4.75	6.190	477	-.71	3.843	129	3.88	3.721
	2012	1472	.20	.846	1466	.14	.849	108	2.27	1.868
75-79 år	2011	628	4.61	4.270	453	-.75	3.619	132	3.14	3.588
	2012	1243	.29	1.081	1237	.23	1.103	129	2.53	2.133
80-84 år	2011	1047	4.84	3.630	790	-.89	3.154	203	3.01	2.408
	2012	1811	.34	1.199	1801	.24	1.137	227	2.23	2.089
85-89 år	2011	1284	4.89	3.808	1040	-.85	3.663	302	2.80	4.000
	2012	2207	.41	1.340	2190	.31	1.338	299	2.60	2.449
90-200 år	2011	1318	5.24	4.173	1110	-.68	3.360	317	3.11	2.966
	2012	1948	.43	1.449	1943	.34	1.436	281	2.59	2.728

a. t cannot be computed because at least one of the groups is empty.

Independent Samples Test

Age Group			Levene's Test for Equality of Variances		t-test for Equality of Means			
			F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
0-17 år	Delayed Discharge Days	Equal variances assumed	1.005	.345	-.353	8	.733	-3.476
		Equal variances not assumed			-.519	7.659	.618	-3.476
18-49 år	Delayed Discharge Days	Equal variances assumed	250.278	.000	13.787	479	.000	3.982
		Equal variances not assumed			9.209	145.156	.000	3.982
	Days From Deadline	Equal variances assumed	172.205	.000	-.442	417	.659	-.101
		Equal variances not assumed			-.230	84.011	.819	-.101
	Payment Days	Equal variances assumed	3.358	.075	.699	37	.489	.932
		Equal variances not assumed			.982	36.986	.333	.932
50-66 år	Delayed Discharge Days	Equal variances assumed	908.409	.000	33.346	2135	.000	4.147
		Equal variances not assumed			21.504	608.245	.000	4.147
	Days From Deadline	Equal variances assumed	786.432	.000	-9.231	1909	.000	-.966
		Equal variances not assumed			-5.211	396.333	.000	-.966
	Payment Days	Equal variances assumed	3.761	.054	1.855	173	.065	.966
		Equal variances not assumed			1.877	172.808	.062	.966
67-74 år	Delayed Discharge Days	Equal variances assumed	445.917	.000	27.680	2155	.000	4.553
		Equal variances not assumed			19.170	695.930	.000	4.553
	Days From Deadline	Equal variances assumed	960.890	.000	-7.843	1941	.000	-.844
		Equal variances not assumed			-4.757	491.190	.000	-.844
	Payment Days	Equal variances assumed	32.387	.000	4.079	235	.000	1.607
		Equal variances not assumed			4.302	195.457	.000	1.607
75-79 år	Delayed Discharge Days	Equal variances assumed	665.091	.000	33.633	1869	.000	4.323
		Equal variances not assumed			24.971	667.941	.000	4.323
	Days From Deadline	Equal variances assumed	582.716	.000	-8.499	1688	.000	-.979
		Equal variances not assumed			-5.661	483.065	.000	-.979
	Payment Days	Equal variances assumed	6.676	.010	1.662	259	.098	.609
		Equal variances not assumed			1.672	214.187	.096	.609
80-84 år	Delayed Discharge Days	Equal variances assumed	1165.581	.000	48.397	2856	.000	4.501
		Equal variances not assumed			38.909	1179.390	.000	4.501
	Days From Deadline	Equal variances assumed	962.157	.000	-13.351	2589	.000	-1.130
		Equal variances not assumed			-9.790	880.225	.000	-1.130
	Payment Days	Equal variances assumed	10.214	.001	3.623	428	.000	.786
		Equal variances not assumed			3.595	402.472	.000	.786
85-89 år	Delayed Discharge Days	Equal variances assumed	1007.542	.000	50.238	3489	.000	4.484
		Equal variances not assumed			40.753	1469.935	.000	4.484
	Days From Deadline	Equal variances assumed	739.944	.000	-13.123	3228	.000	-1.162
		Equal variances not assumed			-9.924	1172.561	.000	-1.162
	Payment Days	Equal variances assumed	.581	.446	.748	599	.455	.203
		Equal variances not assumed			.750	499.761	.454	.203
90-200 år	Delayed Discharge Days	Equal variances assumed	588.318	.000	46.852	3264	.000	4.808
		Equal variances not assumed			40.222	1533.905	.000	4.808
	Days From Deadline	Equal variances assumed	778.028	.000	-11.663	3051	.000	-1.021
		Equal variances not assumed			-9.636	1344.245	.000	-1.021
	Payment Days	Equal variances assumed	2.572	.109	2.191	596	.029	.513
		Equal variances not assumed			2.203	595.184	.028	.513

Group Statistics

Hospital	Ready for discharge year	Delayed Discharge Days			Days From Deadline			Payment Days		
		N	Mean	Std. Deviation	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Akershus universitetssykehus	2011	1465	3.23	6.061	237	2.20	3.817	136	4.32	3.612
	2012	2371	.18	.908	2364	.14	.881	188	2.13	2.203
OUS Aker	2011	593	5.90	3.421	567	-.43	3.109	167	2.90	2.905
	2012	668	.36	1.209	662	.14	1.128	68	2.34	1.750
Diakonhjemmet	2011	1167	5.38	4.340	1151	-.96	4.392	359	3.64	4.466
	2012	1355	.80	1.948	1347	.78	1.944	407	2.62	2.757
Lovisenberg sykehus	2011	951	5.12	2.692	919	-.91	2.612	216	2.31	2.290
	2012	2218	.08	.442	2204	.06	.428	79	1.87	1.159
Ullevål	2011	1447	5.43	3.078	1425	-1.18	3.025	318	2.75	2.505
	2012	3780	.35	1.413	3750	.22	1.407	382	2.76	3.167
Andre	2011	75	4.20	4.182	38	-.34	4.510	10	5.40	4.033
	2012	181	.27	1.114	180	.13	1.150	12	3.08	2.778

Independent Samples Test

Hospital			Levene's Test for Equality of Variances		t-test for Equality of Means			
			F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Akershus universitetssykehus	Delayed Discharge Days	Equal variances assumed	786.375	.000	24.010	3834	.000	3.042
		Equal variances not assumed			19.080	1504.706	.000	3.042
	Days From Deadline	Equal variances assumed	1137.148	.000	21.204	2599	.000	2.058
		Equal variances not assumed			8.278	238.528	.000	2.058
	Payment Days	Equal variances assumed	49.424	.000	6.736	322	.000	2.183
		Equal variances not assumed			6.257	206.636	.000	2.183
OUS Aker	Delayed Discharge Days	Equal variances assumed	217.442	.000	39.217	1259	.000	5.544
		Equal variances not assumed			37.442	722.686	.000	5.544
	Days From Deadline	Equal variances assumed	320.882	.000	-4.322	1227	.000	-.561
		Equal variances not assumed			-4.073	693.392	.000	-.561
	Payment Days	Equal variances assumed	6.537	.011	1.482	233	.140	.560
		Equal variances not assumed			1.811	200.060	.072	.560
Diakonhjemmet	Delayed Discharge Days	Equal variances assumed	421.265	.000	34.961	2520	.000	4.579
		Equal variances not assumed			33.270	1565.281	.000	4.579
	Days From Deadline	Equal variances assumed	426.396	.000	-13.130	2496	.000	-1.742
		Equal variances not assumed			-12.454	1530.437	.000	-1.742
	Payment Days	Equal variances assumed	9.214	.002	3.835	764	.000	1.016
		Equal variances not assumed			3.729	581.253	.000	1.016
Lovisenberg sykehus	Delayed Discharge Days	Equal variances assumed	2110.930	.000	85.559	3167	.000	5.042
		Equal variances not assumed			57.419	972.070	.000	5.042
	Days From Deadline	Equal variances assumed	2073.764	.000	-16.944	3121	.000	-.972
		Equal variances not assumed			-11.223	938.604	.000	-.972
	Payment Days	Equal variances assumed	9.430	.002	1.602	293	.110	.432
		Equal variances not assumed			2.127	264.349	.034	.432
Ullevål	Delayed Discharge Days	Equal variances assumed	1286.004	.000	81.336	5225	.000	5.071
		Equal variances not assumed			60.275	1684.545	.000	5.071
	Days From Deadline	Equal variances assumed	1436.078	.000	-22.670	5173	.000	-1.403
		Equal variances not assumed			-16.827	1663.430	.000	-1.403
	Payment Days	Equal variances assumed	.444	.505	-.059	698	.953	-.013
		Equal variances not assumed			-.060	696.242	.952	-.013
Andre	Delayed Discharge Days	Equal variances assumed	195.731	.000	11.724	254	.000	3.935
		Equal variances not assumed			8.032	78.386	.000	3.935
	Days From Deadline	Equal variances assumed	91.612	.000	-1.244	216	.215	-.475
		Equal variances not assumed			-.645	38.022	.523	-.475
	Payment Days	Equal variances assumed	3.253	.086	1.591	20	.127	2.317
		Equal variances not assumed			1.538	15.538	.144	2.317

Group Statistics

City District	Ready for discharge year	Delayed Discharge Days			Days From Deadline			Payment Days		
		N	Mean	Std. Deviation	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Gamle Oslo	2011	273	5.63	2.687	272	-.40	2.544	73	2.40	2.487
	2012	739	.11	.589	738	.07	.571	26	2.38	1.745
Grünerløkka	2011	347	4.75	2.408	334	-1.20	2.345	56	2.25	2.361
	2012	670	.11	.473	659	.07	.470	28	2.00	.981
Sagene	2011	393	4.74	3.169	392	-1.36	3.186	89	2.96	2.759
	2012	764	.05	.340	763	.02	.296	11	2.00	1.265
St. Hanshaugen	2011	245	6.11	2.903	239	.13	2.907	98	2.68	2.427
	2012	600	.15	.548	594	.13	.546	51	1.63	.937
Frogner	2011	423	5.31	3.976	421	-.73	3.868	136	3.40	3.439
	2012	505	.80	1.827	503	.79	1.843	161	2.52	2.488
Ullern	2011	317	5.68	3.865	316	-.33	4.183	127	3.52	3.443
	2012	330	.25	.859	329	.22	.625	51	1.43	.878
Vestre Aker	2011	300	5.17	5.623	295	-1.93	5.547	70	4.56	7.546
	2012	407	1.41	2.666	401	1.41	2.694	184	3.11	3.229
Nordre Aker	2011	367	5.00	2.059	365	-1.44	2.096	33	2.03	1.704
	2012	774	.12	.931	760	.08	.966	29	2.76	3.916
Bjerke	2011	322	5.56	2.441	319	-.41	2.436	97	1.75	2.450
	2012	676	.28	.866	669	-.02	.833	63	1.24	.734
Grorud	2011	378	3.34	4.018	218	2.59	3.525	135	4.24	3.566
	2012	678	.12	1.759	676	.08	1.686	17	3.88	10.160
Stovner	2011	555	2.53	6.349	2	5.00	11.314	1	13.00	.
	2012	782	.29	.986	781	.27	1.004	98	2.26	1.818
Alna	2011	622	3.88	6.601	27	-1.11	3.080	7	2.43	2.992
	2012	1033	.18	.961	1027	.13	.978	82	2.06	2.650
Østensjø	2011	510	6.38	2.954	508	-.61	2.970	146	2.94	1.931
	2012	1204	.85	1.881	1200	.66	1.937	295	3.08	2.402
Norstrand	2011	507	5.33	3.766	491	-1.68	3.614	107	3.50	2.873
	2012	844	.20	.937	841	.01	.625	33	1.85	1.176
Søndre Norstrand	2011	137	5.27	3.553	137	-.88	3.567	31	3.42	3.905
	2012	567	.04	.365	566	-.04	.386	7	1.29	.756

Independent Samples Test[a]

			Levene's Test for Equality of Variances		t-test for Equality of Means			
	City District		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Delayed Discharge Days	Gamle Oslo	Equal variances assumed	467.115	.000	52.582	1010	.000	5.521
		Equal variances not assumed			33.651	281.699	.000	5.521
	Grünerløkka	Equal variances assumed	631.800	.000	48.198	1015	.000	4.646
		Equal variances not assumed			35.585	359.871	.000	4.646
	Sagene	Equal variances assumed	1013.728	.000	40.437	1155	.000	4.686
		Equal variances not assumed			29.226	396.644	.000	4.686
	St. Hanshaugen	Equal variances assumed	443.852	.000	48.309	843	.000	5.966
		Equal variances not assumed			31.932	251.126	.000	5.966
	Frogner	Equal variances assumed	172.199	.000	22.751	926	.000	4.503
		Equal variances not assumed			21.476	569.518	.000	4.503
	Ullern	Equal variances assumed	404.773	.000	24.875	645	.000	5.427
		Equal variances not assumed			24.426	345.932	.000	5.427
	Vestre Aker	Equal variances assumed	50.958	.000	11.828	705	.000	3.765
		Equal variances not assumed			10.743	398.273	.000	3.765
	Nordre Aker	Equal variances assumed	475.439	.000	55.087	1139	.000	4.875
		Equal variances not assumed			43.313	438.408	.000	4.875
	Bjerke	Equal variances assumed	195.809	.000	50.074	996	.000	5.284
		Equal variances not assumed			37.725	359.977	.000	5.284
	Grorud	Equal variances assumed	525.140	.000	18.025	1054	.000	3.223
		Equal variances not assumed			14.826	458.965	.000	3.223
	Stovner	Equal variances assumed	165.800	.000	9.691	1335	.000	2.237
		Equal variances not assumed			8.230	572.992	.000	2.237
	Alna	Equal variances assumed	313.137	.000	17.702	1653	.000	3.698
		Equal variances not assumed			13.885	636.894	.000	3.698
	Østensjø	Equal variances assumed	149.900	.000	46.444	1712	.000	5.530
		Equal variances not assumed			39.063	690.275	.000	5.530
	Norstrand	Equal variances assumed	729.165	.000	37.738	1349	.000	5.137
		Equal variances not assumed			30.156	543.840	.000	5.137
	Søndre Norstrand	Equal variances assumed	482.619	.000	34.413	702	.000	5.235
		Equal variances not assumed			17.222	136.693	.000	5.235

Days From Deadline	Gamle Oslo	Equal variances assumed	451.256	.000	-4.788	1008	.000	-.478
		Equal variances not assumed			-3.068	281.113	.002	-.478
	Grünerløkka	Equal variances assumed	627.772	.000	-13.439	991	.000	-1.275
		Equal variances not assumed			-9.836	346.622	.000	-1.275
	Sagene	Equal variances assumed	1028.239	.000	-11.864	1153	.000	-1.379
		Equal variances not assumed			-8.552	394.463	.000	-1.379
	St. Hanshaugen	Equal variances assumed	431.243	.000	.034	831	.973	.004
		Equal variances not assumed			.023	244.792	.982	.004
	Frogner	Equal variances assumed	172.684	.000	-7.842	922	.000	-1.525
		Equal variances not assumed			-7.415	577.263	.000	-1.525
	Ullern	Equal variances assumed	336.069	.000	-2.349	643	.019	-.548
		Equal variances not assumed			-2.304	328.521	.022	-.548
	Vestre Aker	Equal variances assumed	50.925	.000	-10.502	694	.000	-3.343
		Equal variances not assumed			-9.554	396.110	.000	-3.343
	Nordre Aker	Equal variances assumed	498.041	.000	-16.664	1123	.000	-1.521
		Equal variances not assumed			-13.206	439.769	.000	-1.521
	Bjerke	Equal variances assumed	251.692	.000	-3.681	986	.000	-.387
		Equal variances not assumed			-2.760	353.931	.006	-.387
	Grorud	Equal variances assumed	311.990	.000	14.144	892	.000	2.506
		Equal variances not assumed			10.128	249.752	.000	2.506
	Stovner	Equal variances assumed	148.227	.000	6.179	781	.000	4.731
		Equal variances not assumed			.591	1.000	.660	4.731
	Alna	Equal variances assumed	99.761	.000	-5.886	1052	.000	-1.240
		Equal variances not assumed			-2.089	26.138	.047	-1.240
	Østensjø	Equal variances assumed	154.690	.000	-10.492	1706	.000	-1.274
		Equal variances not assumed			-8.897	696.421	.000	-1.274
	Norstrand	Equal variances assumed	1082.398	.000	-13.283	1330	.000	-1.697
		Equal variances not assumed			-10.314	507.159	.000	-1.697
	Søndre Norstrand	Equal variances assumed	429.761	.000	-5.501	701	.000	-.843
		Equal variances not assumed			-2.761	136.771	.007	-.843
Payment Days	Gamle Oslo	Equal variances assumed	.337	.563	.024	97	.981	.013
		Equal variances not assumed			.028	62.836	.978	.013
	Grünerløkka	Equal variances assumed	4.265	.042	.536	82	.593	.250
		Equal variances not assumed			.683	80.097	.496	.250
	Sagene	Equal variances assumed	4.473	.037	1.130	98	.261	.955
		Equal variances not assumed			1.987	24.263	.058	.955
	St. Hanshaugen	Equal variances assumed	18.376	.000	2.990	147	.003	1.056
		Equal variances not assumed			3.799	138.502	.000	1.056
	Frogner	Equal variances assumed	15.700	.000	2.556	295	.011	.882
		Equal variances not assumed			2.489	240.998	.013	.882
	Ullern	Equal variances assumed	16.467	.000	4.269	176	.000	2.088
		Equal variances not assumed			6.341	159.545	.000	2.088
	Vestre Aker	Equal variances assumed	3.927	.049	2.135	252	.034	1.443
		Equal variances not assumed			1.547	78.806	.126	1.443
	Nordre Aker	Equal variances assumed	4.721	.034	-.970	60	.336	-.728
		Equal variances not assumed			-.927	37.199	.360	-.728
	Bjerke	Equal variances assumed	6.880	.010	1.619	158	.107	.514
		Equal variances not assumed			1.939	120.819	.055	.514
	Grorud	Equal variances assumed	4.938	.028	.291	150	.771	.355
		Equal variances not assumed			.143	16.500	.888	.355
	Stovner	Equal variances assumed	.	.	5.880	97	.000	10.745
		Equal variances not assumed			.	.	.	10.745
	Alna	Equal variances assumed	.530	.468	.349	87	.728	.368
		Equal variances not assumed			.315	6.828	.762	.368
	Østensjø	Equal variances assumed	4.281	.039	-.626	439	.532	-.143
		Equal variances not assumed			-.673	350.728	.501	-.143
	Norstrand	Equal variances assumed	12.963	.000	3.205	138	.002	1.647
		Equal variances not assumed			4.774	127.658	.000	1.647
	Søndre Norstrand	Equal variances assumed	5.918	.020	1.425	36	.163	2.134
		Equal variances not assumed			2.817	35.847	.008	2.134

a. No statistics are computed for one or more split files

Group Statistics

Discharged to	Ready for discharge year	Delayed Discharge Days			Days From Deadline			Payment Days		
		N	Mean	Std. Deviation	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Hjemme	2011	2155	3.26	4.777	1316	-1.75	3.464	204	2.93	4.996
	2012	5630	.11	.907	5579	.05	.892	178	2.67	3.889
Korttidopphold	2011	2284	5.81	3.386	1917	-.36	3.321	645	3.05	2.683
	2012	3320	.59	1.637	3314	.47	1.613	657	2.59	2.575
Korttid samhandling	2011	5	4.80	2.950	5	-1.20	2.950	1	3.00	.
	2012	130	.25	.781	130	.21	.744	13	2.08	1.320
Korttid intermediær	2011	124	4.48	4.067	62	-.58	3.628	16	3.81	4.053
	2012	231	.26	.887	228	.13	1.062	28	2.07	1.585
Korttid rehabilitering	2011	662	5.76	3.443	613	-.39	3.339	183	3.30	3.135
	2012	801	.49	1.360	799	.41	1.397	152	2.36	2.160
Korttid Vurderingsplass	2011	254	6.07	3.501	248	-.42	3.698	92	3.08	2.966
	2012	185	.64	1.274	184	.58	1.324	57	2.00	1.558
Langtidsopphold	2011	97	8.08	10.514	83	1.13	5.021	37	5.14	4.750
	2012	150	.59	1.555	149	.44	1.535	28	2.68	2.294
Annet	2011	115	4.61	3.629	91	-.75	4.165	28	3.46	4.615
	2012	126	.49	1.532	124	.46	1.516	23	2.48	2.761

Independent Samples Test[a]

Discharged to			Levene's Test for Equality of Variances		t-test for Equality of Means			
			F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Hjemme	Delayed Discharge Days	Equal variances assumed	2169.566	.000	47.314	7783	.000	3.151
		Equal variances not assumed			30.407	2213.637	.000	3.151
	Days From Deadline	Equal variances assumed	2817.858	.000	-34.329	6893	.000	-1.802
		Equal variances not assumed			-18.723	1356.385	.000	-1.802
	Payment Days	Equal variances assumed	.479	.489	.557	380	.578	.258
		Equal variances not assumed			.566	375.293	.571	.258
Korttidopphold	Delayed Discharge Days	Equal variances assumed	984.816	.000	76.709	5602	.000	5.217
		Equal variances not assumed			68.348	3021.933	.000	5.217
	Days From Deadline	Equal variances assumed	1025.148	.000	-12.097	5229	.000	-.828
		Equal variances not assumed			-10.240	2448.496	.000	-.828
	Payment Days	Equal variances assumed	6.513	.011	3.150	1300	.002	.459
		Equal variances not assumed			3.149	1295.441	.002	.459
Korttid samhandling	Delayed Discharge Days	Equal variances assumed	29.201	.000	10.802	133	.000	4.546
		Equal variances not assumed			3.442	4.022	.026	4.546
	Days From Deadline	Equal variances assumed	31.579	.000	-3.457	133	.001	-1.408
		Equal variances not assumed			-1.066	4.020	.346	-1.408
	Payment Days	Equal variances assumed	.	.	.674	12	.513	.923
		Equal variances not assumed			.	.	.	.923
Korttid intermediær	Delayed Discharge Days	Equal variances assumed	171.570	.000	15.100	353	.000	4.212
		Equal variances not assumed			11.386	129.313	.000	4.212
	Days From Deadline	Equal variances assumed	84.296	.000	-2.593	288	.010	-.712
		Equal variances not assumed			-1.528	63.866	.131	-.712
	Payment Days	Equal variances assumed	10.693	.002	2.031	42	.049	1.741
		Equal variances not assumed			1.648	17.662	.117	1.741
Korttid rehabilitering	Delayed Discharge Days	Equal variances assumed	332.607	.000	39.710	1461	.000	5.267
		Equal variances not assumed			37.043	831.085	.000	5.267
	Days From Deadline	Equal variances assumed	291.816	.000	-6.123	1410	.000	-.802
		Equal variances not assumed			-5.580	776.585	.000	-.802
	Payment Days	Equal variances assumed	6.859	.009	3.148	333	.002	.945
		Equal variances not assumed			3.254	322.543	.001	.945
Korttid Vurderingsplass	Delayed Discharge Days	Equal variances assumed	73.254	.000	20.153	437	.000	5.433
		Equal variances not assumed			22.751	338.026	.000	5.433
	Days From Deadline	Equal variances assumed	94.791	.000	-3.493	430	.001	-.997
		Equal variances not assumed			-3.920	326.552	.000	-.997
	Payment Days	Equal variances assumed	16.857	.000	2.529	147	.012	1.076
		Equal variances not assumed			2.894	143.778	.004	1.076
Langtidsopphold	Delayed Discharge Days	Equal variances assumed	31.451	.000	8.597	245	.000	7.496
		Equal variances not assumed			6.973	98.723	.000	7.496
	Days From Deadline	Equal variances assumed	76.218	.000	1.553	230	.122	.690
		Equal variances not assumed			1.220	90.624	.226	.690
	Payment Days	Equal variances assumed	9.633	.003	2.520	63	.014	2.457
		Equal variances not assumed			2.750	54.685	.008	2.457
Annet	Delayed Discharge Days	Equal variances assumed	58.846	.000	11.648	239	.000	4.117
		Equal variances not assumed			11.281	150.483	.000	4.117
	Days From Deadline	Equal variances assumed	47.983	.000	-2.972	213	.003	-1.207
		Equal variances not assumed			-2.639	107.615	.010	-1.207
	Payment Days	Equal variances assumed	2.648	.110	.900	49	.373	.986
		Equal variances not assumed			.944	45.142	.350	.986

a. No statistics are computed for one or more split files

Appendix II - Regressions

Regression models for days from deadline

	Estimate β								
Model	Model VII		Model VIII	Model IX		Model X	Model XI		Model XII
	2011	2012		2011	2012		2011	2012	
(Constant)	-1.464****	.541****	-.748****	-.822	-.220*	-1.287****	-2.186****	-.009	-1.289****
Female	-.100	-.038	-.050	-.097	-.031	-.042	-.119	-.025	-.042
Discharge Ready 2012	-	-	1.179****	-	-	1.160****	-	-	1.156****
0-17 år		6.202****	5.979****		6.099****	5.944****		6.075****	5.905****
50-66 år	-.708*	.004	-.198*	-.829**	-.013	-.227**	-.962**	-.031	-.239**
67-74 år	-.665*	-.042	-.223*	-.741*	-.044	-.254**	-.879**	-.044	-.244**
75-79 år	-.797**	-.014	-.215*	-.914**	-.022	-.241**	-.931**	-.010	-.225*
80-84 år	-.855**	-.066	-.298***	-.994***	-.054	-.327***	-1.143***	-.047	-.320***
85-89 år	-.903[1]**	.020	-.238**	-1.018[1]***	-.008	-.289**	-1.106***	.006	-.279**
90-200 år	-.733[1]*	.008	-.193*	-.904[1]**	-.008	-.245**	-1.008**	.019	-.231**
Gamle Oslo	1.006****	-.480****	-.106	-	-	-	-	-	-
Grünerløkka	-.185	-.518****	-.458****	-	-	-	-	-	-
Sagene	-.258	-.587****	-.556****	-	-	-	-	-	-
St. Hanshaugen	1.322****	-.444****	.043	-	-	-	-	-	-
Frogner	.204	-.002	-.036	-	-	-	-	-	-
Ullern	.698**	-.588****	-.150	-	-	-	-	-	-
Vestre Aker	-1.135****	.643****	-.176	-	-	-	-	-	-
Nordre Aker	-.901****	-.612****	-.710****	-	-	-	-	-	-
Bjerke	.143	-.714****	-.447****	-	-	-	-	-	-
Grorud	3.348****	-.332***	.545****	-	-	-	-	-	-
Stovner	4.561*	-.077	-.054	-	-	-	-	-	-
Alna	-.530	-.283***	-.299*	-	-	-	-	-	-
Norstrand	-1.076****	-.704****	-.879****	-	-	-	-	-	-
Søndre Norstrand	.022	-.664****	-.477****	-	-	-	-	-	-
Akershus universitetssykehus	.698	-.281[1]***	-.095[1]	3.816****	.012	.375****	-	-	-
OUS Aker	.496***	-.077	.207***	.644****	-.059	.248****	-	-	-
Diakonhjemmet	.260	.078	.073	.875****	.565****	.462****	-	-	-
Lovisenberg sykehus	-.119	-.079	-.091	.509***	.072*	.219****	-	-	-
Andre	-.092	-.115	.041	.997*	-.020	.212	-	-	-
Korttidopphold	1.876****	.400****	.746****	1.748****	.355****	.698****	1.519****	.370****	.665****
Korttid samhandling	-.055	.221**	.123	.599	.239**	.351*	.861	.211*	.385**
Korttid intermediær	1.442****	.012	.300**	1.405****	.036	.286**	1.425****	.028	.300**
Korttid rehabilitering	1.907****	.277****	.697****	1.814****	.278****	.704****	1.446****	.331****	.665****
Korttid Vurderingsplass	1.822****	.365****	.722****	1.867****	.375****	.765****	1.482****	.470****	.759****
Langtidsopphold	3.557****	.369****	1.124****	3.337****	.351****	1.146****	3.044****	.390****	1.178****
Annet	1.019***	.346****	.454***	1.047***	.343***	.508****	1.049***	.379****	.521****
Percentage from Africa, Asia, Turkey and South and Central America	-	-	-	.059****	.005**	.016****	-	-	-
percent_pop_over_80	-	-	-	.563[1]****	.136[1]****	.226[1]****	-.600****	.126****	-.028
combined spending on nursing care by 1000 NOK	-	-	-	-.323[1]****	-.029[1]**	-.086[1]****	.313****	-.029****	.035***
Adjusted R Square	.133	.110	.091	.106	.069	.075	.050	.051	.069
Durbin-Watson	1.733	1.768	1.632	1.696	1.666	1.575	1.588	1.636	1.564

**** = p≤0.001, *** = p≤0.01, ** = p≤0.05, * = p≤0.10

[1] = VIF > 10

Regression models for payment days

Model	Estimate β								
	Model XIII		Model XIV	Model XV		Model XVI	Model XVII		Model XVIII
	2011	2012		2011	2012		2011	2012	
(Constant)	3.663****	3.948****	4.446****	4.360****	3.346***	4.018****	2.150***	2.598***	2.712****
Female	-.242	-.321	-.266**	-.203	-.267*	-.233*	-.177	-.261*	-.228*
Discharge Ready 2012	-	-	-.826****	-	-	-.777****	-	-	-.696****
0-17 år		41.491****	40.318****		40.459****	40.504****		40.007****	39.647****
50-66 år	-.488	-.362	-.406	-.458	-.476	-.434	-.499	-.411	-.457
67-74 år	-.451	-.830[1]	-.582	-.371	-.856[1]	-.606	-.226	-.690	-.460
75-79 år	-.974	-.762[1]	-.905*	-1.041	-.797[1]	-.932*	-1.021	-.629[1]	-.846
80-84 år	-1.167*	-1.022[1]	-1.157[1]**	-1.124*	-1.045[1]	-1.135[1]**	-1.144	-.890[1]	-1.054[1]**
85-89 år	-1.311*	-.526[1]	-.958[1]*	-1.294	-.580[1]	-.988[1]**	-1.279*	-.451[1]	-.921[1]**
90-200 år	-1.040	-.567[1]	-.832[1]*	-1.020	-.609[1]	-.845[1]*	-.965	-.468[1]	-.754[1]
Gamle Oslo	-.320	-.549	-.702*	-	-	-	-	-	-
Grünerløkka	-.507	-1.086**	-.949**	-	-	-	-	-	-
Sagene	.177	-1.277*	-.453	-	-	-	-	-	-
St. Hanshaugen	-.042	-1.417[1]***	-.722**	-	-	-	-	-	-
Frogner	-.058	-.508	-.483	-	-	-	-	-	-
Ullern	.002	-1.533**	-.731*	-	-	-	-	-	-
Vestre Aker	.855	.142	.280	-	-	-	-	-	-
Nordre Aker	-1.201*	-.405	-1.021**	-	-	-	-	-	-
Bjerke	-1.362***	-1.956****	-1.778****	-	-	-	-	-	-
Grorud	-.648[1]	-2.439**	-.938	-	-	-	-	-	-
Stovner	7.442**	-1.469*	-1.700**	-	-	-	-	-	-
Alna	-1.500	-1.843**	-2.070***	-	-	-	-	-	-
Norstrand	.561	-1.269***	-.290	-	-	-	-	-	-
Søndre Norstrand	.385	-2.111**	-.531	-	-	-	-	-	-
Akershus universitetssykehus	2.055[1]**	.731[1]	1.331[1]**	2.191****	.780*	1.184****	-	-	-
OUS Aker	.512	-.160	.098	.239	-.278	-.088	-	-	-
Diakonhjemmet	.587	-.139[1]	.232	.468	-.036	.111	-	-	-
Lovisenberg sykehus	-.526	-.300	-.596	-.714*	-.289	-.580**	-	-	-
Andre	2.810**	.678	1.682**	2.871***	.802	1.685***	-	-	-
Korttidopphold	.290	.142	.204	.309	.006	.141	.180	-.008	.094
Korttid samhandling	.392	.442	.557	.341	-.063	.324	.155	-.168	.125
Korttid intermediær	.672	-.297	.136	.742	-.336	.021	1.045	-.282	.146
Korttid rehabilitering	.545	-.041	.218	.540	-.159	.203	.520	-.166	.215
Korttid Vurderingsplass	.683	-.466	.166	.808*	-.617*	.130	.431	-.633*	-.027
Langtidsopphold	2.162****	.395	1.320****	2.258****	.220	1.269****	2.356****	.267	1.375****
Annet	.476	.220	.367	.353	-.088	.199	.469	-.024	.291
Percentage from Africa, Asia, Turkey and South and Central America	-	-	-	-.036**	-.023	-.036***	-	-	-
percent_pop_over_80	-	-	-	-.034[1]	.412[1]*	.076[1]	-.073	.378****	.146*
combined spending on nursing care by 1000 NOK	-	-	-	-.008[1]	-.111[1]	.013[1]	.161**	-.075	.048
Adjusted R Square	.062	.243	.123	.049	.214	.108	.020	.212	.095
Durbin-Watson	2.011	1.894	1.924	2.022	1.823	1.916	1.979	1.803	1.890

**** = p≤0.001, *** = p≤0.01, ** = p≤0.05, * = p≤0.10
[1] = VIF > 10